# On the possible Mathematical Model of Unification. New possible mathematical connections with Ramanujan Recurring Numbers, DN Constant and some parameters of Number Theory and String Theory

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## Abstract

*In this paper, we describe a possible Mathematical Model of Unification. We obtain new possible mathematical connections with Ramanujan Recurring Numbers, DN Constant and some parameters of Number Theory and String Theory*

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# Srinivasa Ramanujan

## (1887 - 1920)

## Introduction

In this paper, an octahedron could serve as a mathematical or conceptual model of the universe in the quantic phase, while the spherical surface could be used to describe the geometry of the bubble-universe.

The values (2√2)/π, the golden ratio φ, ζ(2) and π, can be connected to the proposed cosmological model. Here's how they might be connected:

**Ratio (2√2)/π the so called DN Constant**:

This relationship may have a connection with the geometric properties of the octahedron and the sphere, which have been considered as mathematical models of the early universe and bubbles universe in eternal inflation.

**Golden Ratio φ**:

The golden ratio is a mathematical constant that appears in many natural and artistic contexts and is often associated with harmonious proportions and aesthetic beauty. Its emergence in this context could suggest a kind of intrinsic symmetry or harmony in the structure of the early universe and bubbles universe.

**Value of π**:

The value of π is a fundamental mathematical constant that appears in many geometric formulas and relationships, including the geometry of the sphere. Its appearance could indicate a direct connection between the geometry of bubbles universe and the mathematical properties of spherical surfaces.

Ultimately, the results obtained can be interpreted as manifestations of the geometric and mathematical properties of the models proposed for the early universe and universe bubbles. This suggests that there is a profound connection between geometry, mathematics and cosmological physics, and that through the analysis of these relationships we can deepen our understanding of the universe and its fundamental phenomena.

The above values (2√2)/π, the golden ratio φ and π, can be connected to the proposed cosmological model. This hypothesis is certainly plausible.

The various mathematical solutions and relationships can be seen as representations of the principles and laws that govern the formation and evolution of the universe.

Regarding the fundamental mathematical values, they could emerge as a consequence of the geometric and physical laws that govern the structure and evolution of the quantum universe and bubbles universe.

The multidisciplinary approach involving complex mathematical solutions and cosmological concepts can offer deeper insight into the fundamental nature of the universe and its processes. Exploring these connections could lead to new discoveries and insights into our understanding of the early universe and its complexity.

**Proposal**:

**The initial octahedron**: Let's imagine a regular octahedron, with perfectly symmetrical faces. Each face represents an ideal symmetry.

**The emerging sphere**: Inside the octahedron, there is an inscribed sphere. This sphere represents the bubble of the universe that emerges from the perturbations of the quantum vacuum during eternal inflation.

**Expansion and transitions**: As time passes, the universe expands. The faces of the octahedron begin to break, symbolizing "symmetry breaks." The sphere continues to grow, representing the expanding universe.

**Constants and numbers**: We integrate the mathematical results you obtained. For example, the golden ratio (φ) could be represented by a proportion between the dimensions of the octahedron and the sphere.

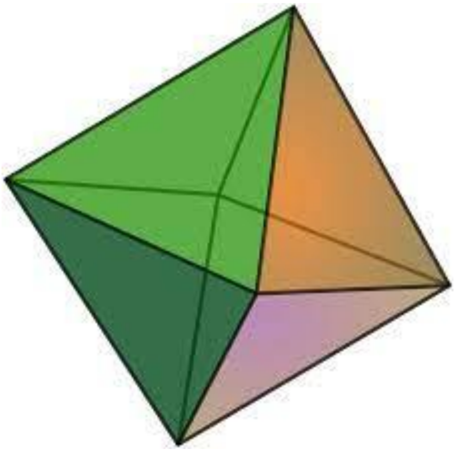
**Entropy and complexity**: Entropy increases as the universe evolves. We can represent this with a disordered growth of structures within the emerging sphere. Imagine this scene as an abstract work of art, where geometric shapes and cosmological concepts merge

In Fig.1 and Fig.2 let's imagine a regular octahedron representing the universe in its phase of high symmetry and very low entropy. Inside the octahedron we have an inscribed sphere that emerges from perturbations of the quantum vacuum during eternal inflation. As time passes, the universe expands, the faces of the octahedron break (symmetry breaks), and entropy increases. Spheres emerge from the octahedra, symbolizing the transition phases from a regime of very low entropy to a universe in which, with the passage of time, entropy increases, increasing the complexity of the universe itself.

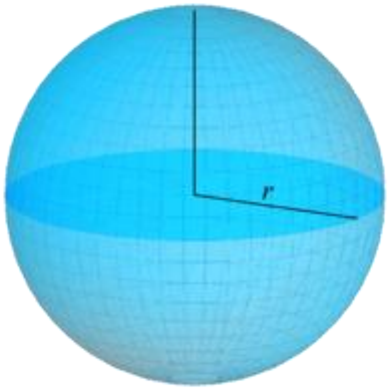
Fig. 1

Fig. 2

Now, we have that:



Octahedron



Sphere

From the octahedron volume $V = 1/3*\sqrt{2}\, l^3$ and, from the sphere volume,

$V = (4/3*\pi*r^3)$ , we consider the following relationship, for $r = x$:

$4/3*\pi*x^3 = 1/3*\sqrt{2}*l^3$

**Input**

$$\frac{4}{3}\pi x^3 = \frac{1}{3}\sqrt{2}\, l^3$$

**Exact result**

$$\frac{4\pi x^3}{3} = \frac{\sqrt{2}\, l^3}{3}$$

## Alternate forms

$$x^3 = \frac{l^3}{2\sqrt{2}\,\pi}$$

$$\frac{4\,\pi\,x^3}{3} - \frac{\sqrt{2}\,l^3}{3} = 0$$

## Real solution

$$x = \frac{(-1)^{2/3}\,l}{\sqrt{2}\,\sqrt[3]{\pi}}$$

## Solutions

$$x = -\frac{\sqrt[3]{-\frac{1}{\pi}}\,l}{\sqrt{2}}$$

,

$$x = \frac{l}{\sqrt{2}\,\sqrt[3]{\pi}}$$

,

$$x = \frac{(-1)^{2/3}\,l}{\sqrt{2}\,\sqrt[3]{\pi}}$$

## Integer solution

$l = 0\,, \quad x = 0$

## Implicit derivatives

$$\frac{\partial x(l)}{\partial l} = \frac{l^2}{2\sqrt{2}\,\pi\,x^2}$$

$$\frac{\partial l(x)}{\partial x} = \frac{2\sqrt{2}\,\pi\,x^2}{l^2}$$

From the alternate form

$$x^3 = \frac{l^3}{2\sqrt{2}\,\pi}$$

$$x = \frac{l}{\sqrt{2}\,\sqrt[3]{\pi}}$$

for l = 8, we have that:

8/(sqrt(2) π^(1/3)) = 8/(2sqrt2 * Pi)^1/3

**Input**

$$\frac{8}{\sqrt{2}\,\sqrt[3]{\pi}} = \frac{8}{\sqrt[3]{2\sqrt{2}\,\pi}}$$

**Result**

True

**Logarithmic form**

$$\log_{\sqrt{2}\,\sqrt[3]{\pi}}(8) - \log_{\sqrt{2}\,\sqrt[3]{\pi}}\left(\sqrt{2}\,\sqrt[3]{\pi}\right) = \log_{\sqrt{2}\,\sqrt[3]{\pi}}(8) - \log_{\sqrt{2}\,\sqrt[3]{\pi}}\left(\sqrt[3]{2\sqrt{2}\,\pi}\right)$$

$\log_b(x)$ is the base- $b$ logarithm

Thence:

l/(sqrt(2) π^(1/3)) = l/(2sqrt2 * Pi)^1/3

**Input**

$$\frac{l}{\sqrt{2}\,\sqrt[3]{\pi}} = \frac{l}{\sqrt[3]{2\sqrt{2}\,\pi}}$$

**Logarithmic form**

$$\log_{\sqrt{2}\,\sqrt[3]{\pi}}(l) - \log_{\sqrt{2}\,\sqrt[3]{\pi}}\left(\sqrt{2}\,\sqrt[3]{\pi}\right) = \log_{\sqrt{2}\,\sqrt[3]{\pi}}(l) - \log_{\sqrt{2}\,\sqrt[3]{\pi}}\left(\sqrt[3]{2\sqrt{2}\,\pi}\right)$$

$\log_b(x)$ is the base- $b$ logarithm

Now, we have that:

l/(2 sqrt(2) π)^(1/3) = (2sqrt2)/Pi

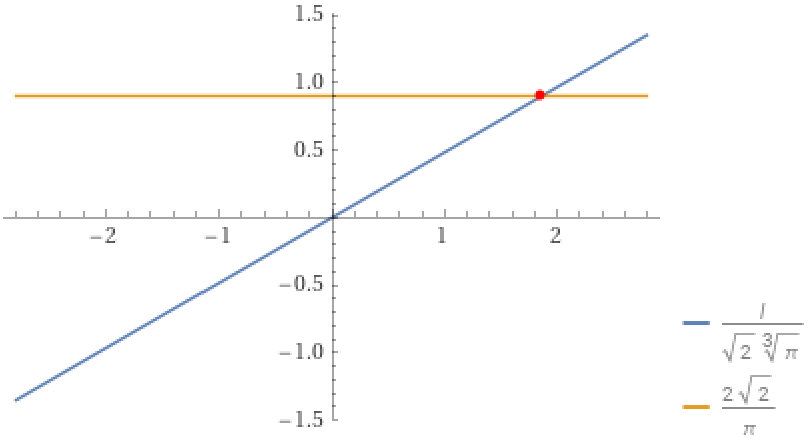
**Input**

$$\frac{l}{\sqrt[3]{2\sqrt{2}\,\pi}} = \frac{2\sqrt{2}}{\pi}$$

**Exact result**

$$\frac{l}{\sqrt{2}\,\sqrt[3]{\pi}} = \frac{2\sqrt{2}}{\pi}$$

## Plot



## Solution

$$l = \frac{4}{\pi^{2/3}}$$

$$l = \frac{4}{\sqrt[3]{\pi^2}}$$

## On the analysis of some fundamental equations

We have the following Schrodinger equation:

$$ih\frac{\partial\Psi}{\partial t}=-\frac{h^2}{2m}\cdot\frac{\partial^2\Psi}{\partial x^2}+V\Psi$$

and the Einstein Field Equation:

$$R_{\mu\nu}-\frac{1}{2}R\,g_{\mu\nu}+\Lambda\,g_{\mu\nu}=\frac{8\pi G}{c^4}T_{\mu\nu}$$

We consider the right-hand side of the two equations:

$$-\frac{h^2}{2m}\cdot\frac{\partial^2\Psi}{\partial x^2}+V\Psi$$

and

$$\frac{8\pi G}{c^4}\cdot T_{\mu\nu}$$

Heisenberg's uncertainty principle expressed in terms of the following operators:

$[\hat{x},\hat{p}]\ \psi(x)=i\,\hbar\ \psi(x)$

we consider always the right-hand side of the equation i ℏ ψ(x)

## Dirac Equation positive and negative frequency plane wave solution

We have the following equations

$$\psi^{+}(x) = \frac{\gamma^{\nu} p_{\nu} + m}{\sqrt{2m(m+E)}} u_s e^{-ip\cdot x}$$

$$\psi^{-}(x) = \frac{-\gamma^{\nu} p_{\nu} + m}{\sqrt{2m(m+E)}} v_s e^{ip\cdot x}$$

we consider always the right-hand side of the second formula

$$\frac{-\gamma^{\nu} p + m}{\sqrt{2m(m+E)}} v \cdot e^{ip\cdot x}$$

## Planck equation concerning the spectral energy density at given temperature

According to Planck's distribution law, the spectral energy density (energy per unit volume per unit frequency) at given temperature is given by:

$$u_{\nu}(\nu, T) = \frac{8\pi h\nu^3}{c^3} \frac{1}{\exp\left(\frac{h\nu}{k_B T}\right) - 1}$$

We consider always the right-hand side of the above formula

$$\frac{8\pi h v^3}{c^3} \frac{1}{exp\left(\frac{hv}{kT}\right) - 1}$$

With regard the 11-dimensional supergravity action, we analyze the following equation:

$$S_{\text{supergravity}} = \frac{1}{2\kappa_{11}^2} \int d^{11}x \sqrt{-g} \left( \mathcal{R} - \frac{1}{48} F_{\mu\nu\lambda\rho} F^{\mu\nu\lambda\rho} \right)$$

where

$$\kappa_{11} = (8\pi)^{\frac{2}{3}} \, \ell_{\text{Planck}}^9$$

$$\left[ \frac{1}{2\kappa_{11}^2} \int d^{11}x \sqrt{-g} \left( \mathcal{R} - \frac{1}{48} F_{\mu\nu\lambda\rho} F^{\mu\nu\lambda\rho} \right) \right] = -3.27370 \times 10^{627} \mathrm{i}$$

Thus, we obtain:

$$\left( -\frac{h^2}{2m} \cdot \frac{\partial^2 \Psi}{\partial x^2} + V\Psi \right) \left( \frac{8\pi G}{c^4} \cdot T_{\mu\nu} \right) (\mathrm{i}\, \hbar\, \psi(\mathrm{x}))$$

$$\left( \frac{-\gamma^v p + m}{\sqrt{2m(m+E)}} v \cdot e^{ip\cdot x} \right) \left( \frac{8\pi h v^3}{c^3} \frac{1}{exp\left(\frac{hv}{kT}\right) - 1} \right) (-3.27370 \times 10^{627}\, \mathrm{i})$$

i.e. γ = 0.57721 , h = 6.6743*10^-11 , ν = 2, m = 8, p = 16 , E = 4096

T = 1.41679*10^32 , $k_B$ = 1.380649*10^-23 , h = 1.0545718*10^-34 ,

c = 3*10^8 , -3.37370*10^627 i

$$\left(-\frac{\hbar^2}{2m}\frac{\partial^2\Phi}{\partial x^2}+V\Phi\right)\times\left(\frac{8\pi G}{c^4}T_{\mu\nu}\right)\times(i\hbar\psi(x))\times\left(\frac{-\gamma^{\nu}p+m}{\sqrt{2m(m+E)}}v\cdot e^{ipx}\right)\times\left(\frac{8\pi h\nu^3}{c^3\left(\exp\left(\frac{h\nu}{k_BT}\right)-1\right)}\right)\times(-3.27370\times10^{627}i)$$

Where

- $\gamma = 0.57721$
- $h = 6.6743\times10^{-11}$
- $\nu = 2$
- $p = 16$
- $m = 8$
- $E = 4096$

- $T = 1.41679\times10^{32}$
- $k_B = 1.380649\times10^{-23}$
- $\hbar = 1.0545718\times10^{-34}$
- $c = 3.0\times10^{8}$
- $-3.27370\times10^{627}i$

1. | Wave function : $i\hbar\psi(x)$

$$i\hbar\psi(x) = i\times(1.0545718\times10^{-34})\times32 = 3.37063\times10^{-33}\,i$$

2. | Bose-Einstein distribution

$$\frac{8\pi h\nu^3}{c^3\left(\exp\left(\frac{h\nu}{k_BT}\right)-1\right)}=\frac{8\pi\times(6.6743\times10^{-11})\times8}{(3.0\times10^8)^3\left(\exp\left(\frac{6.6743\times10^{-11}\times2}{1.380649\times10^{-23}\times1.41679\times10^{32}}\right)-1\right)}$$

$$\exp\left(\frac{6.6743\times 10^{-11}\times 2}{1.380649\times 10^{-23}\times 1.41679\times 10^{32}}\right)\approx 1.0000689$$

so the denominator become $1.0000689-1=6.89061\times 10^{-5}$.

Now, let's calculate $(3.0\times 10^{8})^{3}=2.7\times 10^{25}$

$$8\pi\times(6.6743\times 10^{-11})\times 8=1.344\times 10^{-9}$$

Now, let's calculate the term

$$\frac{1.344\times 10^{-9}}{2.7\times 10^{25}\times 6.89061\times 10^{-5}}\approx 7.23\times 10^{-31}$$

3. TERMINE RELATIVISTICO

$$\frac{-\gamma^{v}p+m}{\sqrt{2m(m+E)}}v\cdot e^{ip\cdot x}=\frac{-0.57721\times 16+8}{\sqrt{2\times 8\times(8+4096)}}\times 1729\cdot e^{i\times 16\cdot x}$$

Let's calculate step by step

$$-\gamma^{v}p+m=-0.57721\times 16+8=-9.23536+8=-1.23536$$

Now let's calculate the denominator

$$\sqrt{2\times 8\times(8+4096)}=\sqrt{2\times 8\times 4104}=\sqrt{65664}\approx 256.1$$

So:

$$\frac{-1.23536}{256.1}\approx -0.00482$$

Now we multiply by $v = 1729$:

$$-0.00482 \times 1729 = -8.33488$$

And the exponential term $e^{ip\cdot x} = e^{i\times 16\cdot x}$ remains unchanged as an oscillating part

4. COMPLEX NUMBER

$$-3.27370 \times 10^{627} i$$

5. Final combination of terms

We multiply all the numerical factors

$$\left(3.37063 \times 10^{-33}\, i\right) \times \left(7.23 \times 10^{-31}\right) \times (-8.33488) \times \left(-3.27370 \times 10^{627} i\right)$$

1. Multiplication of real numbers

$$3.37063 \times 10^{-33} \times 7.23 \times 10^{-31} \times 8.33488 = 1.975 \times 10^{-62}$$

2. Multiplication with the complex term

$$1.975 \times 10^{-62} \times -3.27370 \times 10^{627} = -6.47 \times 10^{565}$$

3. Imaginary part

Since we have a $i \times i = -1$, The final result will be a complex number with imaginary part

Final result $-6.47 \times 10^{565}\, i$

This is the final result in numerical terms

$$\left(-\frac{h^2}{2m}\cdot\frac{\partial^2\Psi}{\partial x^2}+V\Psi\right)\left(\frac{8\pi G}{c^4}\cdot T_{\mu\nu}\right)\left(\mathrm{i}\,\hbar\,\psi(\mathrm{x})\right)$$

$$\left(\frac{-\gamma^{v}p+m}{\sqrt{2m(m+E)}}v\cdot e^{ip\cdot x}\right)\left(\frac{8\pi h v^3}{c^3}\,\frac{1}{exp\left(\frac{hv}{kT}\right)-1}\right)\left(-3.27370 \times 10^{627}\ \mathrm{i}\right) = -6.47 \times 10^{565} i$$

From the above result, we obtain:

Pi(ln(−6.47×10^565  i))+3

**Input**

$\pi \log\left(-\left(6.47\times 10^{565}\right) i\right)+3$

log($x$) is the natural logarithm

$i$ is the imaginary unit

**Result**

$4095.95410\ldots -$
$4.93480220\ldots i$

**Alternate complex forms**

$4095.957072481979467$
$(\cos(-0.0012047986116705424)+i\sin(-0.0012047986116705424))$

$4095.957072481979467\, e^{-0.0012047986116705424\, i}$

**Polar coordinates**

$r = 4095.957072481979467$ (radius), $\theta = -0.0012047986116705424$ (angle)

$4095.957072481979467 \approx 4096$

The number 4096 = $64^2$ = $8^4$, is the Ramanujan Recurring Number, that when multiplied by 2 give 8192. The total amplitude vanishes for gauge group SO(8192) for bosonic string SO(8192), while the vacuum energy is negative and independent of the gauge group. The vacuum energy and dilaton tadpole to lowest non-trivial order for the open bosonic string. While the vacuum energy is non-zero and independent of the gauge group, the dilaton tadpole is zero for a unique choice of gauge group, SO($2^{13}$) i.e. SO(8192). This could be the implications for a pre-big bang scenario where only self-perturbative bosonic strings lived when the enthalpy was extremely low as discussed above. This regime contains all the intrinsic properties of superstrings inherent in the bosonic strings, would at the big bang give effect to the properties of matter (fermions) as Higgs Boson. This number theoretic connection to the gauge group SO(8192), gives a much more compelling relevance of the bosonic string theory SO(8192), to quantum gravity and places this string theory where it should appropriately be in the evolution of the universe from a quantum gravity perspective rather than it be neglected because it doesn't include fermionic strings to confirm to post big-bang reality. The vanishing of the bosonic string's amplitude could be explained by the effect of extreme low entropy on the quantum vacuum geometry. Thus, as the entropy increases infinitesimally as a result of the vacuum self-perturbation then also is the amplitude of the vibrating bosonic strings from zero. Thus, was right to indicate that the "vanishing of the amplitude of the bosonic string could be the results of string theory itself", but here, we give a much more elaborate explanation of what could be happening.

## Alternative representations

$$\pi \log\left(-i\,6.47\times 10^{565}\right)+3 = 3+\pi \log_e\left(-6.47\,i\,10^{565}\right)$$

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$$\pi \log\left(-i\,6.47\times 10^{565}\right)+3 = 3+\pi \log(a)\log_a\left(-6.47\,i\,10^{565}\right)$$

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$$\pi \log\left(-i\,6.47\times 10^{565}\right)+3 = 3-\pi\,\mathrm{Li}_1\left(1+6.47\,i\,10^{565}\right)$$

$\log_b(x)$ is the base- $b$ logarithm

$\mathrm{Li}_n(x)$ is the polylogarithm function

## Series representations

$$\pi \log\left(-i\,6.47\times 10^{565}\right)+3 = \\ 3+\pi \log\left(-1.000000000000000-6.470000000000000\times 10^{565}\,i\right)- \\ \pi \sum_{k=1}^{\infty}\frac{(-1)^k\left(-1.000000000000000-6.470000000000000\times 10^{565}\,i\right)^{-k}}{k}$$

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$$\pi \log\left(-i\,6.47\times 10^{565}\right)+3=3+2\pi^2\mathcal{A}\left\lfloor\frac{\arg\left(-6.470000000000000\times 10^{565}\,i-1.000000000000000\,x\right)}{2\pi}\right\rfloor+\pi\log(x)-\pi\sum_{k=1}^{\infty}\frac{(-1)^k\left(-6.470000000000000\times 10^{565}\,i-1.000000000000000\,x\right)^k x^{-k}}{k}\quad\text{for } x<0$$

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$$\pi \log\left(-i\,6.47\times 10^{565}\right)+3=3+2\pi^2\mathcal{A}\left\lfloor-\frac{-\pi+\arg\left(-\frac{6.470000000000000\times 10^{565}\,i}{z_0}\right)+\arg(z_0)}{2\pi}\right\rfloor+\pi\log(z_0)-\pi\sum_{k=1}^{\infty}\frac{(-1)^k\left(-6.470000000000000\times 10^{565}\,i-1.000000000000000\,z_0\right)^k z_0^{-k}}{k}$$

$\arg(z)$ is the complex argument

$\lfloor x\rfloor$ is the floor function

## Integral representations

$$\pi \log\left(-i\,6.47\times 10^{565}\right)+3=3+\pi\int_1^{-6.470000000000000\times 10^{565}\,i}\frac{1}{t}\,dt$$

$$\pi \log\left(-i\,6.47\times 10^{565}\right)+3=3+\frac{1}{2\mathcal{A}}\int_{-\mathcal{A}\,\infty+\gamma}^{\mathcal{A}\,\infty+\gamma}\frac{\left(-1.000000000000000-6.470000000000000\times 10^{565}\,i\right)^{-s}\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds\quad\text{for } -1<\gamma<0$$

$\Gamma(x)$ is the gamma function

27sqrt(Pi(ln(−6.47×10^565 i))+3)+1

## Input

$$27\sqrt{\pi\log\left(-\left(6.47\times 10^{565}\right)i\right)+3}+1$$

log($x$) is the natural logarithm

$i$ is the imaginary unit

## Result

$1728.99063\ldots -$
$1.04094048\ldots i$

## Alternate complex forms

$$1728.9909447716049484 \left(\cos(-0.00060205089494785554) + i\sin(-0.00060205089494785554)\right)$$

$$1728.9909447716049484\, e^{-0.00060205089494785554\, i}$$

## Polar coordinates

$r = 1728.9909447716049484$ (radius), $\theta = -0.00060205089494785554$ (angle)

1728.9909447716049484…

This result is very near to the mass of candidate glueball $f_0(1710)$ scalar meson. Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve $1728 = 8^2 \times 3^3$. The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number, as it can be expressed as the sum of two cubes in two different ways $10^3 + 9^3 = 12^3 + 1^3 = 1729$ and Ramanujan's recurring number). Since bosons are made of gauge bosons and scalar bosons (meson), then this number theoretic analysis perhaps confirms that the number 1729, confirm the fact that both the gauge and scalar bosons are actually different states of a single bosonic string, and that these states are isomorphic or that the states vibrations are synchronised with the state of the bosonic string. This also imply that each state lives inside a cubic or octahedron as a spherical cloud, and that the total sum of these two states is the state of the bosonic string. Taking the cross section of the bosonic string, we realise that it must be a rectangular, or a two shaped octahedron. As the string vibrates in difference frequencies, so is the two spherical cloud states inside the string. That is, the string vibrations simply excites the gauge bosons i.e Photon, gluon, W and Z inside one cube/octahedron, and the scalar boson i.e. Higgs inside the other cube/octahedron.

Furthermore, if we bring the picture of loop quantum gravity (LQG) with the property of a discontinues quantum geometry, we can therefore, think of the graviton living on the vertices of the rectangles or the octahedrons. This graviton then acts a glue binding the bosonic strings lattice together forming a complete cross section of alternating states of between the gauge bosons and scalar bosons. This arrangement of states then gives a precise supersymmetric quantum picture of the vacuum geometry at low entropy.

But the geometry further reveals very important fact, that since the vacuum geometry is discontinues, then we observe that there is no relation whatsoever between the quantum vibrational frequencies of the strings, and that of the vertices of the vacuum geometry where the graviton lives. Ashtekar et al., (2021) asserted that gravity is simply a manifestation of spacetime geometry. Thus, the graviton cannot be a string boson, however, there is a duality between gravity and strings. Also, gauge bosons have spin-1, while the graviton has spin-2. Then lastly, because of the thermodynamic constraints we were able to arrive at the results we have, now this bring us to this fundamental question; that string theory and LQG theory are two intrinsic aspects of a complete quantum gravity theory we are after? That is, without the other no complete and compelling quantum geometry can be attained, as it is done here? This need to be investigated further.

**Alternative representations**

$$27\sqrt{\pi\log\left(-i\,6.47\times 10^{565}\right)+3}+1=1+27\sqrt{3+\pi\log_e\left(-6.47\,i\,10^{565}\right)}$$

$$27\sqrt{\pi\log\left(-i\,6.47\times 10^{565}\right)+3}+1=1+27\sqrt{3+\pi\log(a)\log_a\left(-6.47\,i\,10^{565}\right)}$$

$$27\sqrt{\pi\log\left(-i\,6.47\times 10^{565}\right)+3}+1=1+27\sqrt{3-\pi\,\mathrm{Li}_1\left(1+6.47\,i\,10^{565}\right)}$$

$\log_b(x)$ is the base- $b$ logarithm

$\mathrm{Li}_n(x)$ is the polylogarithm function

## Series representations

$$27\sqrt{\pi\log\left(-i\,6.47\times 10^{565}\right)+3}+1=$$
$$1+27\sqrt{\left(3+\pi\left(\log\left(-1.000000000000000-6.470000000000000\times 10^{565}\,i\right)-\sum_{k=1}^{\infty}\frac{1}{k}(-1)^k\left(-1.000000000000000-6.470000000000000\times 10^{565}\,i\right)^{-k}\right)\right)}$$

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$$27\sqrt{\pi\log\left(-i\,6.47\times 10^{565}\right)+3}+1=$$
$$1+27\sqrt{2+\pi\log\left(-6.470000000000000\times 10^{565}\,i\right)}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(2+\pi\log\left(-6.470000000000000\times 10^{565}\,i\right)\right)^{-k}$$

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$$27\sqrt{\pi\log\left(-i\,6.47\times 10^{565}\right)+3}+1=$$
$$1+27\sqrt{2+\pi\log\left(-6.470000000000000\times 10^{565}\,i\right)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(2+\pi\log\left(-6.470000000000000\times 10^{565}\,i\right)\right)^{-k}\left(-\frac{1}{2}\right)_k}{k!}$$

$\binom{n}{m}$ is the binomial coefficient

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

## Integral representations

$$27\sqrt{\pi\log(-i\,6.47\times10^{565})+3}+1=1+27\sqrt{3+\pi\int_1^{-6.470000000000000\times10^{565}\,i}\frac{1}{t}\,dt}$$

$$27\sqrt{\pi\log(-i\,6.47\times10^{565})+3}+1=1+27\sqrt{\left(3+\frac{1}{2\mathcal{A}}\int_{-\mathcal{A}\,\infty+\gamma}^{\mathcal{A}\,\infty+\gamma}\frac{1}{\Gamma(1-s)}(-1.000000000000000-6.470000000000000\times10^{565}\,i)^{-s}\,\Gamma(-s)^2\,\Gamma(1+s)\,ds\right)}\quad\text{for }-1<\gamma<0$$

$\Gamma(x)$ is the gamma function

(27sqrt(Pi(ln(−6.47×10^565  i))+3)+1)^1/15+(MRB const)^(1-1/(4π)+π)

## Input

$$\sqrt[15]{27\sqrt{\pi\log(-(6.47\times10^{565})\,i)+3}+1}+C_{\mathrm{MRB}}{}^{1-1/(4\pi)+\pi}$$

$\log(x)$ is the natural logarithm

$i$ is the imaginary unit

$C_{\mathrm{MRB}}$ is the MRB constant

## Result

1.6449374489… −
0.000065977338919… $i$

## Alternate complex forms

$$1.64493745018839964253\,(\cos(-0.0000401093299501 7358) + i\sin(-0.0000401093299501 7358))$$

$$1.64493745018839964253\,e^{-0.0000401093299501 7358\,i}$$

## Polar coordinates

$r = 1.64493745018839964253$ (radius), $\theta = -0.0000401093299501 7358$ (angle)

1.64493745018839964253… ≈ $\zeta(2) = \pi^2/6 = 1.644934$ (trace of the instanton shape and Ramanujan Recurring Number)

And again:

((Pi(ln(−6.47×10^565 i))+3)+(27sqrt(Pi(ln(−6.47×10^565 i))+3)+1))^1/18

## Input

$$\sqrt[18]{\left(\pi \log\left(-\left(6.47\times 10^{565}\right) i\right) + 3\right) + \left(27\sqrt{\pi \log\left(-\left(6.47\times 10^{565}\right) i\right) + 3} + 1\right)}$$

$\log(x)$ is the natural logarithm

$i$ is the imaginary unit

## Result

$1.618761588\ldots -$
$0.00009225933346\ldots\, i$

## Alternate complex forms

$$1.61876159029330653270\,(\cos(-0.000056993774788254 88) + i\sin(-0.00005699377478825488))$$

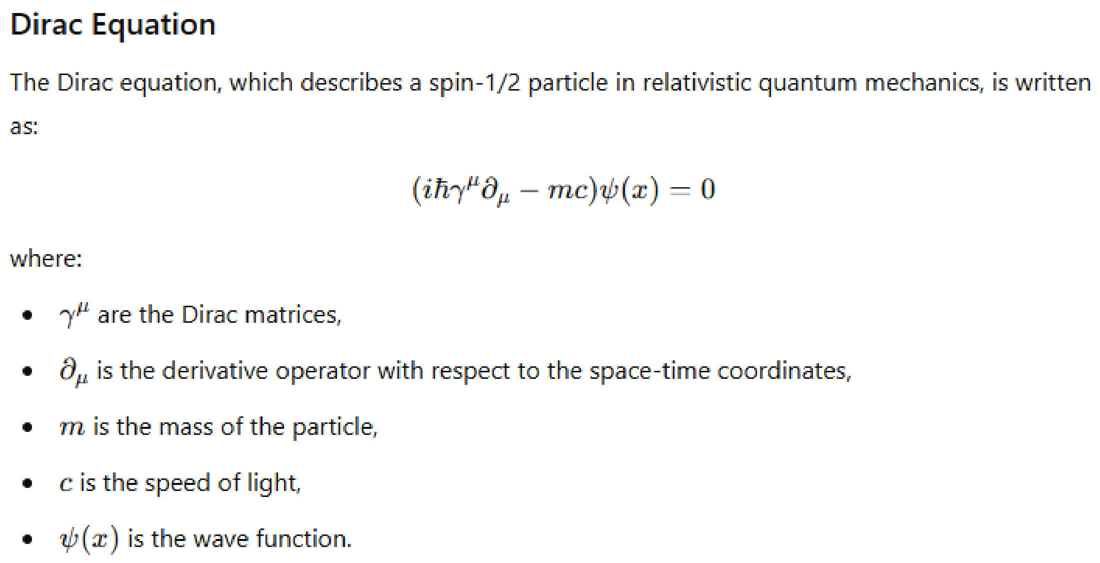
$$1.61876159029330653270\,e^{-0.00005699377478825488\,i}$$

## Polar coordinates

$r = 1.61876159029330653270$ (radius), $\theta = -0.00005699377478825488$ (angle)

1.61876159029330653270… result that is a very good approximation to the value of the golden ratio 1.618033988749… (Ramanujan Recurring Number)

Now, instead of the fourth product we insert the Dirac equation and perform the calculation with the same values of the previous expression



### Dirac Equation

The Dirac equation, which describes a spin-1/2 particle in relativistic quantum mechanics, is written as:

$$(i\hbar\gamma^{\mu}\partial_{\mu} - mc)\psi(x) = 0$$

where:

- $\gamma^{\mu}$ are the Dirac matrices,
- $\partial_{\mu}$ is the derivative operator with respect to the space-time coordinates,
- $m$ is the mass of the particle,
- $c$ is the speed of light,
- $\psi(x)$ is the wave function.

2. **Bose-Einstein distribution**:

This term was calculated earlier and the result was:

$$7.23 \times 10^{-31}$$

3. **Dirac equation**:

In the case of the Dirac equation, we're dealing with the term that involves the wave function $\psi(x)$ and the relativistic terms acting on it. Since we're not explicitly writing out the Dirac matrices or the derivative operators, we can approximate it as a term involving the particle mass $m$ and the speed of light $c$.

Thus, we approximate the relativistic term as:

$$(i\hbar\gamma^{\mu}\partial_{\mu} - mc)\psi(x) \approx \text{a term involving the wave function } \psi(x)$$

For simplicity, we treat this term as:

$$(i\hbar\psi(x)) \times \text{a constant factor related to mass and the speed of light}$$

In the calculation we're doing, we can treat the relativistic term (usually described by the Dirac equation) as a product of the wave function, possibly with relativistic terms, as indicated in the fourth product of your original expression. The Dirac equation involves the wave function $\psi(x)$, so we can consider it as a term to be replaced in the calculation.

### The complete expression with the substitution

So, your expression becomes:

$$\left(-\frac{h^2}{2m}\frac{\partial^2\Psi}{\partial x^2} + V\Psi\right) \times \left(\frac{8\pi G}{c^4}T_{\mu\nu}\right) \times (i\hbar\psi(x)) \times ((i\hbar\gamma^{\mu}\partial_{\mu} - mc)\psi(x)) \times \left(\frac{8\pi h\nu^3}{c^3\left(\exp\left(\frac{h\nu}{k_B T}\right) - 1\right)}\right) \times (-3.27370 \times 10^{627} i)$$

### Steps for the numerical calculation

1. **Wave function $i\hbar\psi(x)$**:

We already calculated this earlier:

$$i\hbar\psi(x) = 3.37063 \times 10^{-33}\, i$$

2. **Bose-Einstein distribution**:

This term was calculated earlier and the result was:

$$7.23 \times 10^{-31}$$

3. **Dirac equation**:

In the case of the Dirac equation, we're dealing with the term that involves the wave function $\psi(x)$ and the relativistic terms acting on it. Since we're not explicitly writing out the Dirac matrices or the derivative operators, we can approximate it as a term involving the particle mass $m$ and the speed of light $c$.

Thus, we approximate the relativistic term as:

$$(i\hbar\gamma^{\mu}\partial_{\mu} - mc)\psi(x) \approx \text{a term involving the wave function } \psi(x)$$

For simplicity, we treat this term as:

$$(i\hbar\psi(x)) \times \text{a constant factor related to mass and the speed of light}$$

So we approximate this term as:

$$3.37063 \times 10^{-33}\, i \times \text{a constant factor related to mass and speed of light}$$

4. **Complex number**:

The complex number we will multiply at the end is:

$$-3.27370 \times 10^{627} i$$

## Final calculation

Now we combine all the numerical factors. Your complete expression becomes:

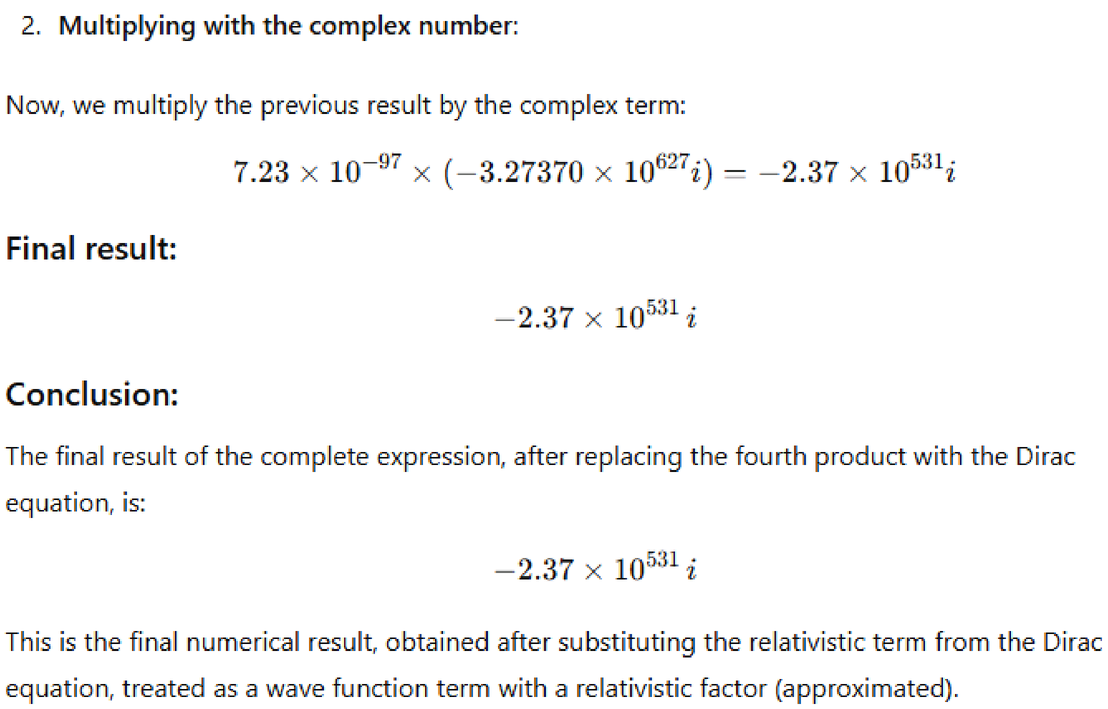
$$\left(3.37063 \times 10^{-33}\, i\right) \times \left(7.23 \times 10^{-31}\right) \times \left(3.37063 \times 10^{-33}\, i\right) \times \left(-3.27370 \times 10^{627} i\right)$$

**Numerical steps:**

1. **Multiplying the real numbers**:

We multiply the real numbers:

$$3.37063 \times 10^{-33} \times 7.23 \times 10^{-31} \times 3.37063 \times 10^{-33} = 7.23 \times 10^{-97}$$



2. **Multiplying with the complex number:**

Now, we multiply the previous result by the complex term:

$$7.23 \times 10^{-97} \times (-3.27370 \times 10^{627} i) = -2.37 \times 10^{531} i$$

### Final result:

$$-2.37 \times 10^{531}\, i$$

### Conclusion:

The final result of the complete expression, after replacing the fourth product with the Dirac equation, is:

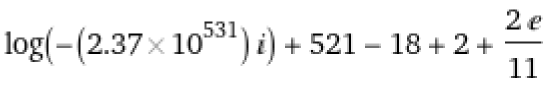
$$-2.37 \times 10^{531}\, i$$

This is the final numerical result, obtained after substituting the relativistic term from the Dirac equation, treated as a wave function term with a relativistic factor (approximated).

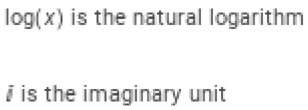
From the above result, we obtain:

ln(−2.37×10^531  i)+521-18+2+(2e)/11

## Input



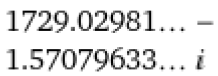
$$\log\left(-\left(2.37\times 10^{531}\right) i\right) + 521 - 18 + 2 + \frac{2\,e}{11}$$



log(*x*) is the natural logarithm

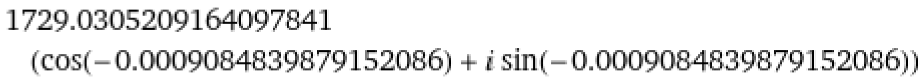
*i* is the imaginary unit

## Result



1729.02981… −
1.57079633… *i*

## Alternate complex forms



$$1729.0305209164097841\left(\cos(-0.00090848398791520860) + i\sin(-0.00090848398791520860)\right)$$

$$1729.0305209164097841\, e^{-0.0009084839879152086\, i}$$

### Polar coordinates

$r = 1729.0305209164097841$ (radius), $\theta = -0.0009084839879152086$ (angle)

1729.0305209…

This result is very near to the mass of candidate glueball $f_0(1710)$ scalar meson. Furthermore, $1728$ occurs in the algebraic formula for the j-invariant of an elliptic curve $1728 = 8^2 \times 3^3$. The number $1728$ is one less than the Hardy–Ramanujan number $1729$ (taxicab number, as it can be expressed as the sum of two cubes in two different ways $10^3 + 9^3 = 12^3 + 1^3 = 1729$ and Ramanujan's recurring number). Since bosons are made of gauge bosons and scalar bosons (meson), then this number theoretic analysis perhaps confirms that the number $1729$, confirm the fact that both the gauge and scalar bosons are actually different states of a single bosonic string, and that these states are isomorphic or that the states vibrations are synchronised with the state of the bosonic string. This also imply that each state lives inside a cubic or octahedron as a spherical cloud, and that the total sum of these two states is the state of the bosonic string. Taking the cross section of the bosonic string, we realise that it must be a rectangular, or a two shaped octahedron. As the string vibrates in difference frequencies, so is the two spherical cloud states inside the string. That is, the string vibrations simply excites the gauge bosons i.e Photon, gluon, W and Z inside one cube/octahedron, and the scalar boson i.e. Higgs inside the other cube/octahedron.

Furthermore, if we bring the picture of loop quantum gravity (LQG) with the property of a discontinues quantum geometry, we can therefore, think of the graviton living on the vertices of the rectangles or the octahedrons. This graviton then acts a glue binding the bosonic strings lattice together forming a complete cross section of alternating states of between the gauge bosons and scalar bosons. This arrangement of states then gives a precise supersymmetric quantum picture of the vacuum geometry at low entropy.

But the geometry further reveals very important fact, that since the vacuum geometry is discontinues, then we observe that there is no relation whatsoever between the quantum vibrational frequencies of the strings, and that of the vertices of the vacuum geometry where the graviton lives. Ashtekar et al., (2021) asserted that gravity is simply a manifestation of spacetime geometry. Thus, the graviton cannot be a string boson, however, there is a duality between gravity and strings. Also, gauge bosons have spin-1, while the graviton has spin-2. Then lastly, because of the thermodynamic constraints we were able to arrive at the results we have, now this bring us to this fundamental question; that string theory and LQG theory are two intrinsic aspects of a complete quantum gravity theory we are after? That is, without the other no complete and compelling quantum geometry can be attained, as it is done here? This need to be investigated further.

## Alternative representations

$$\log\left(-i\,2.37\times 10^{531}\right)+521-18+2+\frac{2\,e}{11}=505+\log_e\left(-2.37\,i\,10^{531}\right)+\frac{2\,e}{11}$$

---

$$\log\left(-i\,2.37\times 10^{531}\right)+521-18+2+\frac{2\,e}{11}=505+\log(a)\log_a\left(-2.37\,i\,10^{531}\right)+\frac{2\,e}{11}$$

---

$$\log\left(-i\,2.37\times 10^{531}\right)+521-18+2+\frac{2\,e}{11}=505-\text{Li}_1\left(1+2.37\,i\,10^{531}\right)+\frac{2\,e}{11}$$

$\log_b(x)$ is the base- $b$ logarithm

$\text{Li}_n(x)$ is the polylogarithm function

## Series representations

$$\log\left(-i\,2.37\times 10^{531}\right)+521-18+2+\frac{2\,e}{11}=$$
$$505+\frac{2\,e}{11}+\log\left(-1.0000000000000000-2.370000000000000\times 10^{531}\,i\right)-\sum_{k=1}^{\infty}\frac{(-1)^k\left(-1.0000000000000000-2.370000000000000\times 10^{531}\,i\right)^{-k}}{k}$$

---

$$\log\left(-i\,2.37\times 10^{531}\right)+521-18+2+\frac{2e}{11}=505+\frac{2e}{11}+2\pi\mathcal{A}\left\lfloor\frac{\arg\left(-2.370000000000000\times 10^{531}\,i-1.000000000000000\,x\right)}{2\pi}\right\rfloor+\log(x)-\sum_{k=1}^{\infty}\frac{(-1)^k\left(-2.370000000000000\times 10^{531}\,i-1.000000000000000\,x\right)^k x^{-k}}{k}\quad \text{for } x<0$$

---

$$\log\left(-i\,2.37\times 10^{531}\right)+521-18+2+\frac{2e}{11}=505+\frac{2e}{11}+\left\lfloor\frac{\arg\left(-2.370000000000000\times 10^{531}\,i-1.000000000000000\,z_0\right)}{2\pi}\right\rfloor\log\left(\frac{1}{z_0}\right)+\log(z_0)+\left\lfloor\frac{\arg\left(-2.370000000000000\times 10^{531}\,i-1.000000000000000\,z_0\right)}{2\pi}\right\rfloor\log(z_0)-\sum_{k=1}^{\infty}\frac{(-1)^k\left(-2.370000000000000\times 10^{531}\,i-1.000000000000000\,z_0\right)^k z_0^{-k}}{k}$$

$\arg(z)$ is the complex argument

$\lfloor x\rfloor$ is the floor function

## Integral representations

$$\log\left(-i\,2.37\times 10^{531}\right)+521-18+2+\frac{2e}{11}=505+\frac{2e}{11}+\int_1^{-2.370000000000000\times 10^{531}\,i}\frac{1}{t}\,dt$$

$$\log\left(-i\,2.37\times 10^{531}\right)+521-18+2+\frac{2e}{11}=505+\frac{2e}{11}+\frac{1}{2\pi\mathcal{A}}\int_{-\mathcal{A}\,\infty+\gamma}^{\mathcal{A}\,\infty+\gamma}\frac{\left(-1.000000000000000-2.370000000000000\times 10^{531}\,i\right)^{-s}\Gamma(-s)^2\,\Gamma(1+s)}{\Gamma(1-s)}\,ds\quad \text{for } -1<\gamma<0$$

$\Gamma(x)$ is the gamma function

(1/27((ln(−2.37×10^531  i)+521-18+2+(2e)/11)-1))^2-MRB const

**Input**

$$\left(\frac{1}{27}\left(\left(\log\left(-\left(2.37\times 10^{531}\right) i\right)+521-18+2+\frac{2e}{11}\right)-1\right)\right)^2-C_{\mathrm{MRB}}$$

log($x$) is the natural logarithm

$i$ is the imaginary unit

$C_{\mathrm{MRB}}$ is the MRB constant

**Result**

4095.95007… −
7.44686660… $i$

**Alternate complex forms**

$$4095.956835655226488\left(\cos(-0.0018181028259975644)+i\sin(-0.0018181028259975644)\right)$$

$$4095.956835655226488\,e^{-0.0018181028259975644\,i}$$

**Polar coordinates**

$r = 4095.956835655226488$ (radius),  $\theta = -0.0018181028259975644$ (angle)

4095.95683…≈ 4096

The number 4096 = $64^2$ = $8^4$, is the Ramanujan Recurring Number, that when multiplied by 2 give 8192. The total amplitude vanishes for gauge group SO(8192) for bosonic string SO(8192), while the vacuum energy is negative and independent of the gauge group. The vacuum energy and dilaton tadpole to lowest non-trivial order for the open bosonic string. While the vacuum energy is non-zero and independent of the gauge group, the dilaton tadpole is zero for a unique choice of gauge group, SO($2^{13}$) i.e. SO(8192). This could be the implications for a pre-big bang scenario where only self-perturbative bosonic strings lived when the enthalpy was extremely low as discussed above. This regime contains all the intrinsic properties of superstrings inherent in the bosonic strings, would at the big bang give effect to the properties of matter (fermions) as Higgs Boson. This number theoretic connection to the gauge group SO(8192), gives a much more compelling relevance of the bosonic string theory SO(8192), to quantum gravity and places this string theory where it should appropriately be in the evolution of the universe from a quantum gravity perspective rather than it be neglected because it doesn't include fermionic strings to confirm to post big-bang reality. The vanishing of the bosonic string's amplitude could be explained by the effect of extreme low entropy on the quantum vacuum geometry. Thus, as the entropy increases infinitesimally as a result of the vacuum self-perturbation then also is the amplitude of the vibrating bosonic strings from zero. Thus, was right to indicate that the "vanishing of the amplitude of the bosonic string could be the results of string theory itself", but here, we give a much more elaborate explanation of what could be happening.

((ln(−2.37×10^531 i)+521-18+2+(2e)/11)+((1/27((ln(−2.37×10^531 i)+521-18+2+(2e)/11)-1))^2-MRB const))^1/18

**Input**

$$\left(\left(\log\left(-\left(2.37\times 10^{531}\right)i\right)+521-18+2+\frac{2e}{11}\right)+\left(\left(\frac{1}{27}\left(\left(\log\left(-\left(2.37\times 10^{531}\right)i\right)+521-18+2+\frac{2e}{11}\right)-1\right)\right)^2-C_{\text{MRB}}\right)\right)\hat{}\ (1/18)$$

$\log(x)$ is the natural logarithm

$i$ is the imaginary unit

$C_{\text{MRB}}$ is the MRB constant

**Result**

1.618762187… −
0.0001392226091… $i$

## Alternate complex forms

$1.6187621932941633829$
$(\cos(-0.000086005597293359 86) + i \sin(-0.00008600559729335986))$

$1.6187621932941633829\, e^{-0.00008600559729335986\, i}$

## Polar coordinates

$r = 1.6187621932941633829$ (radius), $\theta = -0.00008600559729335986$ (angle)

1.618762193…. result that is a very good approximation to the value of the golden ratio 1.618033988749… (Ramanujan Recurring Number)

(ln(−2.37×10^531 i)+521-18+2+(2e)/11)^1/15+(MRB const)^(1-1/(4π)+π)

## Input

$$\sqrt[15]{\log\left(-\left(2.37\times 10^{531}\right) i\right) + 521 - 18 + 2 + \frac{2\, e}{11}} + C_{\mathrm{MRB}}^{1-1/(4\,\pi)+\pi}$$

$\log(x)$ is the natural logarithm

$i$ is the imaginary unit

$C_{\mathrm{MRB}}$ is the MRB constant

## Result

$1.644939956\ldots -$
$0.00009955877140\ldots\, i$

## Alternate complex forms

$1.6449399585925902 2987$
$(\cos(-0.000060524258612486 89) + i \sin(-0.00006052425861248689))$

$1.64493995859259022987\, e^{-0.00006052425861248689\, i}$

**Polar coordinates**

$r = 1.644939958592590229 87$ (radius), $\theta = -0.000060524258612486 89$ (angle)

1.644939958….≈ ζ(2) = π²/6 = 1.644934 (trace of the instanton shape and Ramanujan Recurring Number)

**An Update on Brane Supersymmetry Breaking** - *J. Mourad and A. Sagnotti* - arXiv:1711.11494v1 [hep-th] 30 Nov 2017

From the following vacuum equations:

$$T\, e^{\gamma_E\, \phi} \;=\; -\,\frac{\beta_E^{(p)}\, h^2}{\gamma_E}\; e^{-2\,(8-p)\,C + 2\,\beta_E^{(p)}\,\phi}$$

$$16\, k'\, e^{-2C} \;=\; \frac{h^2 \left(p \,+\, 1 \,-\, \frac{2\,\beta_E^{(p)}}{\gamma_E}\right) e^{-2\,(8-p)\,C + 2\,\beta_E^{(p)}\,\phi}}{(7\,-\,p)}$$

$$(A')^2 \;=\; k\, e^{-2A} \,+\, \frac{h^2}{16(p\,+\,1)} \left(7 \,-\, p \,+\, \frac{2\,\beta_E^{(p)}}{\gamma_E}\right) e^{-2\,(8-p)\,C + 2\,\beta_E^{(p)}\,\phi}$$

we have obtained, from the results almost equals of the equations, putting

$4096\, e^{-\pi\sqrt{18}}$ instead of

$$e^{-2(8-p)C+2\beta_E^{(p)}\phi}$$

a new possible mathematical connection between the two exponentials. Thence, also the values concerning $p$, $C$, $\beta_E$ and $\phi$ correspond to the exponents of $e$ (i.e. of exp). Thence we obtain for p = 5 and $\beta_E = 1/2$:

$$e^{-6C+\phi} = 4096e^{-\pi\sqrt{18}}$$

Therefore, with respect to the exponentials of the vacuum equations, the Ramanujan's exponential has a coefficient of 4096 which is equal to $64^2$, while $-6C+\phi$ is equal to $-\pi\sqrt{18}$. From this it follows that it is possible to establish mathematically, the dilaton value.

For

exp((-Pi*sqrt(18)) we obtain:

**Input:**

$\exp\left(-\pi\sqrt{18}\right)$

**Exact result:**

$e^{-3\sqrt{2}\,\pi}$

**Decimal approximation:**

$1.6272016226072509292942156739117979541838581136954016\ldots \times 10^{-6}$

$1.6272016\ldots * 10^{-6}$

**Property:**

$e^{-3\sqrt{2}\pi}$ is a transcendental number

**Series representations:**

$$e^{-\pi\sqrt{18}} = e^{-\pi\sqrt{17}\sum_{k=0}^{\infty} 17^{-k}\binom{1/2}{k}}$$

$$e^{-\pi\sqrt{18}} = \exp\left(-\pi\sqrt{17}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{17}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)$$

$$e^{-\pi\sqrt{18}} = \exp\left(-\frac{\pi\sum_{j=0}^{\infty}\operatorname{Res}_{s=-\frac{1}{2}+j} 17^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{2\sqrt{\pi}}\right)$$

Now, we have the following calculations:

$$e^{-6C+\phi} = 4096e^{-\pi\sqrt{18}}$$

$$e^{-\pi\sqrt{18}} = 1.6272016\ldots * 10^{-6}$$

from which:

$$\frac{1}{4096}e^{-6C+\phi} = 1.6272016\ldots * 10^{-6}$$

$$0.000244140625\, e^{-6C+\phi} = e^{-\pi\sqrt{18}} = 1.6272016\ldots * 10^{-6}$$

Now:

$$\ln\left(e^{-\pi\sqrt{18}}\right) = -13.328648814475 = -\pi\sqrt{18}$$

And:

(1.6272016* 10^-6) *1/ (0.000244140625)

**Input interpretation:**

$$\frac{1.6272016}{10^6} \times \frac{1}{0.000244140625}$$

**Result:**

0.0066650177536

0.006665017...

Thence:

$$0.000244140625\, e^{-6C+\phi} = e^{-\pi\sqrt{18}}$$

Dividing both sides by 0.000244140625, we obtain:

$$\frac{0.000244140625}{0.000244140625} e^{-6C+\phi} = \frac{1}{0.000244140625} e^{-\pi\sqrt{18}}$$

$$e^{-6C+\phi} = 0.0066650177536$$

((((exp((-Pi*sqrt(18)))))))*1/0.000244140625

**Input interpretation:**

$$\exp\left(-\pi\sqrt{18}\right)\times\frac{1}{0.000244140625}$$

**Result:**

0.00666501785…

0.00666501785…

**Series representations:**

$$\frac{\exp\left(-\pi\sqrt{18}\right)}{0.000244141} = 4096\exp\left(-\pi\sqrt{17}\sum_{k=0}^{\infty}17^{-k}\binom{\frac{1}{2}}{k}\right)$$

$$\frac{\exp\left(-\pi\sqrt{18}\right)}{0.000244141} = 4096\exp\left(-\pi\sqrt{17}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{17}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)$$

$$\frac{\exp\left(-\pi\sqrt{18}\right)}{0.000244141} = 4096\exp\left(-\frac{\pi\sum_{j=0}^{\infty}\operatorname{Res}_{s=-\frac{1}{2}+j}17^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{2\sqrt{\pi}}\right)$$

Now:

$$e^{-6C+\phi} = 0.0066650177536$$

$$\exp\left(-\pi\sqrt{18}\right)\times\frac{1}{0.000244140625} =$$

$$e^{-\pi\sqrt{18}}\times\frac{1}{0.000244140625}$$

= 0.00666501785…

From:

ln(0.00666501784619)

**Input interpretation:**

$\log(0.00666501784619)$

**Result:**

$-5.010882647757\ldots$

-5.010882647757…

**Alternative representations:**

$\log(0.006665017846190000) = \log_e(0.006665017846190000)$

$\log(0.006665017846190000) = \log(a)\log_a(0.006665017846190000)$

$\log(0.006665017846190000) = -\mathrm{Li}_1(0.993334982153810000)$

**Series representations:**

$$\log(0.00666501784619000) = -\sum_{k=1}^{\infty} \frac{(-1)^k (-0.99333498215381000)^k}{k}$$

$$\log(0.00666501784619000) = 2 i \pi \left\lfloor \frac{\arg(0.00666501784619000 - x)}{2 \pi} \right\rfloor + \log(x) - \sum_{k=1}^{\infty} \frac{(-1)^k (0.00666501784619000 - x)^k x^{-k}}{k} \quad \text{for } x < 0$$

$$\log(0.00666501784619000) = \left\lfloor \frac{\arg(0.00666501784619000 - z_0)}{2 \pi} \right\rfloor \log\left(\frac{1}{z_0}\right) + \log(z_0) + \left\lfloor \frac{\arg(0.00666501784619000 - z_0)}{2 \pi} \right\rfloor \log(z_0) - \sum_{k=1}^{\infty} \frac{(-1)^k (0.00666501784619000 - z_0)^k z_0^{-k}}{k}$$

**Integral representation:**

$$\log(0.00666501784619000) = \int_1^{0.00666501784619000} \frac{1}{t} \, dt$$

In conclusion:

$$-6C + \phi = -5.010882647757 \ldots$$

and for C = 1, we obtain:

$$\phi = -5.010882647757 + 6 = 0.989117352243 = \boldsymbol{\phi}$$

Note that the values of $n_s$ (spectral index) 0.965, of the average of the Omega mesons Regge slope 0.987428571 and of the dilaton 0.989117352243, are also connected to the following two Rogers-Ramanujan continued fractions:

$$\frac{e^{-\frac{\pi}{5}}}{\sqrt{(\varphi-1)\sqrt{5}}-\varphi+1}=1-\cfrac{e^{-\pi}}{1+\cfrac{e^{-2\pi}}{1+\cfrac{e^{-3\pi}}{1+\cfrac{e^{-4\pi}}{1+\dots}}}}\approx 0.9568666373$$

$$\frac{e^{-\frac{\pi}{\sqrt{5}}}}{\dfrac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\varphi^{5}\sqrt[4]{5^{3}}}-1}}-\varphi+1}=1-\cfrac{e^{-\pi\sqrt{5}}}{1+\cfrac{e^{-2\pi\sqrt{5}}}{1+\cfrac{e^{-3\pi\sqrt{5}}}{1+\cfrac{e^{-4\pi\sqrt{5}}}{1+\dots}}}}\approx 0.9991104684$$

(http://www.bitman.name/math/article/102/109/)

From this equation concerning the Brane Supersymmetry Breaking

$$(A')^2 \;=\; k\,e^{-2A} \;+\; \frac{h^2}{16(p+1)}\left(7-p+\frac{2\,\beta_E^{(p)}}{\gamma_E}\right)\,e^{-2(8-p)C+2\beta_E^{(p)}\phi}$$

for p = 5 and $\beta_E$ = 1/2 and $e^{-6C+\phi} = 4096e^{-\pi\sqrt{18}}$

(k*e^(-2A))+(h^2)/(16(5+1))*(7-5+1/γ)*($4096e^{-\pi\sqrt{18}}$)

**Input**

$$k\,e^{-2A}+\frac{h^2}{16\,(5+1)}\left(7-5+\frac{1}{\gamma}\right)\left(4096\,e^{-\pi\sqrt{18}}\right)$$

## Result

$$e^{-2A}\,k + \frac{128}{3}\,e^{-3\sqrt{2}\,\pi}\left(\frac{1}{\gamma} + 2\right)h^2$$

## Alternate forms

$$\frac{3\,e^{3\sqrt{2}\,\pi-2A}\,\gamma\,k + 256\,\gamma\,h^2 + 128\,h^2}{3\,e^{3\sqrt{2}\,\pi}\,\gamma}$$

$$\frac{3\,e^{-2A}\,\gamma\,k + 128\,e^{-3\sqrt{2}\,\pi}\,(2\,\gamma + 1)\,h^2}{3\,\gamma}$$

$$\frac{e^{-2A-3\sqrt{2}\,\pi}\left(256\,e^{2A}\,\gamma\,h^2 + 128\,e^{2A}\,h^2 + 3\,e^{3\sqrt{2}\,\pi}\,\gamma\,k\right)}{3\,\gamma}$$

## Expanded form

$$e^{-2A}\,k + \frac{128\,e^{-3\sqrt{2}\,\pi}\,h^2}{3\,\gamma} + \frac{256}{3}\,e^{-3\sqrt{2}\,\pi}\,h^2$$

## Roots

$$256\,e^{2A}\,h^2 + 3\,e^{3\sqrt{2}\,\pi}\,k \neq 0\,, \quad h \neq 0\,, \quad \gamma = -\frac{128\,e^{2A}\,h^2}{256\,e^{2A}\,h^2 + 3\,e^{3\sqrt{2}\,\pi}\,k}$$

$$\gamma \neq 0\,, \quad h = 0\,, \quad k = 0$$

## Series expansion at A=0

$$\left(\frac{128}{3}e^{-3\sqrt{2}\,\pi}\left(\frac{1}{\gamma}+2\right)h^2+k\right)-2\,A\,k+2\,A^2\,k-\frac{4\,A^3\,k}{3}+\frac{2\,A^4\,k}{3}+O\left(A^5\right)$$

(Taylor series)

## Derivative

$$\frac{\partial}{\partial A}\left(k\,e^{-2\,A}+\frac{h^2\left(7-5+\frac{1}{\gamma}\right)\left(4096\,e^{-\pi\sqrt{18}}\right)}{16\,(5+1)}\right)=-2\,e^{-2\,A}\,k$$

## Indefinite integral

$$\int\left(e^{-2\,A}\,k+\frac{128}{3}e^{-3\sqrt{2}\,\pi}\,h^2\left(2+\frac{1}{\gamma}\right)\right)dA=$$
$$\frac{128}{3}e^{-3\sqrt{2}\,\pi}\,A\left(\frac{1}{\gamma}+2\right)h^2-\frac{1}{2}e^{-2\,A}\,k+\text{constant}$$

## Limit

$$\lim_{\gamma\to\pm\infty}\left(e^{-2\,A}\,k+\frac{128}{3}e^{-3\sqrt{2}\,\pi}\,h^2\left(2+\frac{1}{\gamma}\right)\right)=$$
$$\frac{1}{3}\left(3\,e^{-2\,A}\,k+256\,e^{-3\sqrt{2}\,\pi}\,h^2\right)\approx 0.333333\left(3\times 2.71828^{-2\,A}\,k+0.000416564\,h^2\right)$$

## Alternative representations

$$k\,e^{-2\,A}+\frac{\left(\left(7-5+\frac{1}{\gamma}\right)\left(4096\,e^{-\pi\sqrt{18}}\right)\right)h^2}{16\,(5+1)}=$$
$$k\,z^{-2\,A}+\frac{\left(\left(7-5+\frac{1}{\gamma}\right)\left(4096\,z^{-\pi\sqrt{18}}\right)\right)h^2}{16\,(5+1)}\quad\text{for } z=e$$

$$k\,e^{-2A} + \frac{\left(\left(7-5+\frac{1}{\gamma}\right)\left(4096\,e^{-\pi\sqrt{18}}\right)\right)h^2}{16\,(5+1)} = k\,w^a + \frac{\left(\left(7-5+\frac{1}{\gamma}\right)(4096\,w^a)\right)h^2}{16\,(5+1)}$$

$$\text{for}\left(a = -\frac{2A}{\log(w)}\ \text{and}\ a = -\frac{3\sqrt{2}\,\pi}{\log(w)}\right)$$

---

$$k\,e^{-2A} + \frac{\left(\left(7-5+\frac{1}{\gamma}\right)\left(4096\,e^{-\pi\sqrt{18}}\right)\right)h^2}{16\,(5+1)} = k\left(1+\frac{2}{-1+\coth(-A)}\right) + \frac{4096}{96}\,h^2\left(2+\frac{1}{\gamma}\right)\left(1+\frac{2}{-1+\coth\left(-\frac{\pi\sqrt{18}}{2}\right)}\right)$$

log($x$) is the natural logarithm

coth($x$) is the hyperbolic cotangent function

## Series representations

$$k\,e^{-2A} + \frac{\left(\left(7-5+\frac{1}{\gamma}\right)\left(4096\,e^{-\pi\sqrt{18}}\right)\right)h^2}{16\,(5+1)} = \sum_{\mathcal{A}=0}^{\infty}\frac{3\times 2^{\mathcal{A}}\,(-A)^{\mathcal{A}}\,k\,\gamma + 2^{7+\mathcal{A}/2}\,h^2\,(-3\pi)^{\mathcal{A}}\,(1+2\gamma)}{3\,\gamma\,\mathcal{A}!}$$

---

$$k\,e^{-2A} + \frac{\left(\left(7-5+\frac{1}{\gamma}\right)\left(4096\,e^{-\pi\sqrt{18}}\right)\right)h^2}{16\,(5+1)} = \sum_{\mathcal{A}=0}^{\infty}\frac{e^{z_0}\left(3\,k\,\gamma\,(-2A-z_0)^{\mathcal{A}} + 128\,h^2\,(1+2\gamma)\left(-3\sqrt{2}\,\pi - z_0\right)^{\mathcal{A}}\right)}{3\,\gamma\,\mathcal{A}!}$$

---

$$k\,e^{-2A} + \frac{\left(\left(7-5+\frac{1}{\gamma}\right)\left(4096\,e^{-\pi\sqrt{18}}\right)\right)h^2}{16\,(5+1)} = \sum_{\mathcal{A}=0}^{\infty}\left(\frac{2^{-1+2\mathcal{A}}\,(-A)^{-1+2\mathcal{A}}\,k\,(-2A+2\mathcal{A})}{(2\mathcal{A})!} + \frac{2^{7+1/2(-1+2\mathcal{A})}\times 3^{-2+2\mathcal{A}}\,h^2\,(-\pi)^{-1+2\mathcal{A}}\left(-3\sqrt{2}\,\pi+2\mathcal{A}\right)\left(2+\frac{1}{\gamma}\right)}{(2\mathcal{A})!}\right)$$

$n!$ is the factorial function

Multiply the result

$$e^{-2A}\,k+\frac{128}{3}\,e^{-3\sqrt{2}\,\pi}\left(\frac{1}{\gamma}+2\right)h^2$$

by the formula of the extended DN Constant, we obtain:

((e^(-2 A) k + 128/3 e^(-3 sqrt(2) π) h^2 (2 + 1/γ)))*(((((((5/12*(3+√5)*d^3)/(4/3*π*(d/2)^3))*1/((1/3*√2*a^3)/(4/3*π*(a/2)^3)) *1/((((√2 d^3)/12))*1/(4/3*π*(d/2)^3)))))^(1/(2π))))

**Input**

$$\left(e^{-2A}\,k+\frac{128}{3}\,e^{-3\sqrt{2}\,\pi}\,h^2\left(2+\frac{1}{\gamma}\right)\right)\sqrt[2\pi]{\frac{\frac{5}{12}\left(3+\sqrt{5}\right)d^3}{\frac{4}{3}\,\pi\left(\frac{d}{2}\right)^3}\times\frac{1}{\frac{\frac{1}{3}\sqrt{2}\,a^3}{\frac{4}{3}\,\pi\left(\frac{a}{2}\right)^3}}\times\frac{1}{\left(\frac{1}{12}\left(\sqrt{2}\,d^3\right)\right)\times\frac{1}{\frac{4}{3}\,\pi\left(\frac{d}{2}\right)^3}}}$$

**Exact result**

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\left(e^{-2A}\,k+\frac{128}{3}\,e^{-3\sqrt{2}\,\pi}\left(\frac{1}{\gamma}+2\right)h^2\right)$$

**Alternate forms**

$$\frac{2^{-1/\pi}\sqrt[2\pi]{\left(15+5\sqrt{5}\right)\pi}\left(3\,e^{-2A}\,\gamma\,k+128\,e^{-3\sqrt{2}\,\pi}\,(2\,\gamma+1)\,h^2\right)}{3\,\gamma}$$

$$\frac{2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;e^{-2A-3\sqrt{2}\,\pi}\left(256\,e^{2A}\,\gamma\,h^2+128\,e^{2A}\,h^2+3\,e^{3\sqrt{2}\,\pi}\,\gamma\,k\right)}{3\,\gamma}$$

## Expanded form

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;e^{-2A}\,k+\frac{2^{7-1/\pi}\,e^{-3\sqrt{2}\,\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;h^2}{3\gamma}+\frac{1}{3}\times 2^{8-1/\pi}\,e^{-3\sqrt{2}\,\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;h^2$$

## Alternate form assuming A, h, k, and $\gamma$ are positive

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;e^{-2A}\,k+\frac{1}{3}\times 2^{7-1/\pi}\,e^{-3\sqrt{2}\,\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;\left(\frac{1}{\gamma}+2\right)h^2$$

## Roots

$$256\,e^{2A}\,h^2+3\,e^{3\sqrt{2}\,\pi}\,k\neq 0,\quad h\neq 0,\quad \gamma=-\frac{128\,e^{2A}\,h^2}{256\,e^{2A}\,h^2+3\,e^{3\sqrt{2}\,\pi}\,k}$$

$$\gamma\neq 0,\quad h=0,\quad k=0$$

## Series expansion at A=0

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;\left(\frac{128}{3}\,e^{-3\sqrt{2}\,\pi}\left(\frac{1}{\gamma}+2\right)h^2+k\right)-2^{(\pi-1)/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;A\,k+2^{(\pi-1)/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;A^2\,k-\frac{1}{3}A^3\left(2^{2-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;k\right)+\frac{1}{3}\times 2^{(\pi-1)/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;A^4\,k+O\left(A^5\right)$$

(Taylor series)

## Derivative

$$\frac{\partial}{\partial A}\left(\left(e^{-2A}\,k+\frac{128}{3}\,e^{-3\sqrt{2}\,\pi}\,h^2\left(2+\frac{1}{\gamma}\right)\right)\sqrt[2\pi]{\frac{5\left(3+\sqrt{5}\right)d^3}{\frac{\left(12\left(4\pi\left(\frac{d}{2}\right)^3\right)\right)\left(\sqrt{2}\,a^3\right)\left(\sqrt{2}\,d^3\right)}{\frac{3\left(3\left(4\pi\left(\frac{a}{2}\right)^3\right)\right)\left(12\left(4\pi\left(\frac{d}{2}\right)^3\right)\right)}{3\times 3}}}}\right)=$$

$$-2^{(\pi-1)/\pi}\,\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;e^{-2A}\,k$$

## Indefinite integral

$$\int 2^{-1/\pi}\,\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;\left(e^{-2A}\,k+\frac{128}{3}\,e^{-3\sqrt{2}\,\pi}\,h^2\left(2+\frac{1}{\gamma}\right)\right)da=$$

$$2^{-1/\pi}\,\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;a\,e^{-2A}\,k+\frac{1}{3}\times 2^{7-1/\pi}\,e^{-3\sqrt{2}\,\pi}\,\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;a\left(\frac{1}{\gamma}+2\right)h^2+\text{constant}$$

## Limit

$$\lim_{\gamma\to\pm\infty} 2^{-1/\pi}\,\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;\left(e^{-2A}\,k+\frac{128}{3}\,e^{-3\sqrt{2}\,\pi}\,h^2\left(2+\frac{1}{\gamma}\right)\right)=$$

$$\frac{1}{3}\times 2^{-1/\pi}\,\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;e^{-2A-3\sqrt{2}\,\pi}\left(256\,e^{2A}\,h^2+3\,e^{3\sqrt{2}\,\pi}\,k\right)\approx$$

$$0.539336\times 2.71828^{-2A-13.3286}\left(256\times 2.71828^{2A}\,h^2+1.84366\times 10^6\,k\right)$$

## Alternative representations

$$\left(e^{-2A}k+\frac{1}{3}e^{-3\sqrt{2}\,\pi}\,128\,h^2\left(2+\frac{1}{\gamma}\right)\right)\sqrt[2\pi]{\frac{5\left(3+\sqrt{5}\right)d^3}{\frac{\left(\left(\sqrt{2}\,a^3\right)\left(\sqrt{2}\,d^3\right)\right)12\left(4\pi\left(\frac{d}{2}\right)^3\right)}{\frac{\left(\left(3\left(4\pi\left(\frac{a}{2}\right)^3\right)\right)\left(12\left(4\pi\left(\frac{d}{2}\right)^3\right)\right)\right)3}{3\times 3}}}} =$$

$$\left(k\left(1+\frac{2}{-1+\coth(-A)}\right)+\frac{128}{3}h^2\left(2+\frac{1}{\gamma}\right)\left(1+\frac{2}{-1+\coth\left(-\frac{3\pi\sqrt{2}}{2}\right)}\right)\right)$$

$$\sqrt[2\pi]{\frac{5\,d^3\left(3+\sqrt{5}\right)}{\frac{12\left(4\pi\left(\frac{d}{2}\right)^3\right)\left(a^3\sqrt{2}\right)\left(d^3\sqrt{2}\right)}{\frac{3\left(3\left(4\pi\left(\frac{a}{2}\right)^3\right)\right)\left(12\left(4\pi\left(\frac{d}{2}\right)^3\right)\right)}{3\times 3}}}}$$

---

$$\left(e^{-2A}k+\frac{1}{3}e^{-3\sqrt{2}\,\pi}\,128\,h^2\left(2+\frac{1}{\gamma}\right)\right)\sqrt[2\pi]{\frac{5\left(3+\sqrt{5}\right)d^3}{\frac{\left(\left(\sqrt{2}\,a^3\right)\left(\sqrt{2}\,d^3\right)\right)12\left(4\pi\left(\frac{d}{2}\right)^3\right)}{\frac{\left(\left(3\left(4\pi\left(\frac{a}{2}\right)^3\right)\right)\left(12\left(4\pi\left(\frac{d}{2}\right)^3\right)\right)\right)3}{3\times 3}}}} =$$

$$\left(z^{-2A}k+\frac{1}{3}z^{-3\sqrt{2}\,\pi}\,128\,h^2\left(2+\frac{1}{\gamma}\right)\right)\sqrt[2\pi]{\frac{5\left(3+\sqrt{5}\right)d^3}{\frac{\left(\left(\sqrt{2}\,a^3\right)\left(\sqrt{2}\,d^3\right)\right)12\left(4\pi\left(\frac{d}{2}\right)^3\right)}{\frac{\left(\left(3\left(4\pi\left(\frac{a}{2}\right)^3\right)\right)\left(12\left(4\pi\left(\frac{d}{2}\right)^3\right)\right)\right)3}{3\times 3}}}} \quad \text{for } z=e$$

---

$$\left(e^{-2A} k+\frac{1}{3} e^{-3\sqrt{2}\,\pi} 128 h^2\left(2+\frac{1}{\gamma}\right)\right) \sqrt[2\pi]{\frac{5\left(3+\sqrt{5}\right) d^3}{\frac{\left(\left(\sqrt{2}\, a^3\right)\left(\sqrt{2}\, d^3\right)\right) 12\left(4\pi\left(\frac{d}{2}\right)^3\right)}{\frac{\left(\left(3\left(4\pi\left(\frac{a}{2}\right)^3\right)\right)\left(12\left(4\pi\left(\frac{d}{2}\right)^3\right)\right)\right) 3}{3\times 3}}}} =$$

$$\sqrt[2\pi]{\frac{5 d^3\left(3+\sqrt{5}\right)}{\frac{12\left(4\pi\left(\frac{d}{2}\right)^3\right)\left(a^3\sqrt{2}\right)\left(d^3\sqrt{2}\right)}{\frac{3\left(3\left(4\pi\left(\frac{a}{2}\right)^3\right)\right)\left(12\left(4\pi\left(\frac{d}{2}\right)^3\right)\right)}{3\times 3}}}}$$
$$\left(k\left(-1+\frac{2}{1-\tanh(-A)}\right)+\frac{128}{3} h^2\left(2+\frac{1}{\gamma}\right)\left(-1+\frac{2}{1-\tanh\left(-\frac{3\pi\sqrt{2}}{2}\right)}\right)\right)$$

$\coth(x)$ is the hyperbolic cotangent function

$\tanh(x)$ is the hyperbolic tangent function

## Series representations

$$\left(e^{-2A} k+\frac{1}{3} e^{-3\sqrt{2}\,\pi} 128 h^2\left(2+\frac{1}{\gamma}\right)\right) \sqrt[2\pi]{\frac{5\left(3+\sqrt{5}\right) d^3}{\frac{\left(\left(\sqrt{2}\, a^3\right)\left(\sqrt{2}\, d^3\right)\right) 12\left(4\pi\left(\frac{d}{2}\right)^3\right)}{\frac{\left(\left(3\left(4\pi\left(\frac{a}{2}\right)^3\right)\right)\left(12\left(4\pi\left(\frac{d}{2}\right)^3\right)\right)\right) 3}{3\times 3}}}} =$$
$$2^{-1/\pi} \sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi} \sum_{\mathcal{A}=0}^{\infty} \frac{3\times 2^{\mathcal{A}} (-A)^{\mathcal{A}} k\gamma + 2^{7+\mathcal{A}/2} h^2 (-3\pi)^{\mathcal{A}} (1+2\gamma)}{3\gamma\,\mathcal{A}!}$$

---

$$\left(e^{-2A} k+\frac{1}{3} e^{-3\sqrt{2}\,\pi} 128 h^2\left(2+\frac{1}{\gamma}\right)\right) \sqrt[2\pi]{\frac{5\left(3+\sqrt{5}\right) d^3}{\frac{\left(\left(\sqrt{2}\, a^3\right)\left(\sqrt{2}\, d^3\right)\right) 12\left(4\pi\left(\frac{d}{2}\right)^3\right)}{\frac{\left(\left(3\left(4\pi\left(\frac{a}{2}\right)^3\right)\right)\left(12\left(4\pi\left(\frac{d}{2}\right)^3\right)\right)\right) 3}{3\times 3}}}} =$$
$$2^{-1/\pi} \sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi} \sum_{\mathcal{A}=0}^{\infty} \frac{1}{3(1+2\mathcal{A})!} 2^{\mathcal{A}} \left(3\times 2^{\mathcal{A}} (-A)^{2\mathcal{A}} k (1-2A+2\mathcal{A}) + 128 h^2 (-3\pi)^{2\mathcal{A}} \left(1-3\sqrt{2}\,\pi+2\mathcal{A}\right)\left(2+\frac{1}{\gamma}\right)\right)$$

---

$$\left(e^{-2A}\,k+\frac{1}{3}\,e^{-3\sqrt{2}\,\pi}\,128\,h^2\left(2+\frac{1}{\gamma}\right)\right)\sqrt[2\pi]{\frac{5\left(3+\sqrt{5}\right)d^3}{\frac{\left(\left(\sqrt{2}\,a^3\right)\left(\sqrt{2}\,d^3\right)\right)12\left(4\pi\left(\frac{d}{2}\right)^3\right)}{\frac{\left(\left(3\left(4\pi\left(\frac{a}{2}\right)^3\right)\right)\left(12\left(4\pi\left(\frac{d}{2}\right)^3\right)\right)\right)3}{3\times 3}}}}=$$

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\sum_{\mathcal{A}=0}^{\infty}\frac{e^{z_0}\left(3\,k\,\gamma\,(-2\,A-z_0)^{\mathcal{A}}+128\,h^2\,(1+2\,\gamma)\left(-3\sqrt{2}\,\pi-z_0\right)^{\mathcal{A}}\right)}{3\,\gamma\,\mathcal{A}!}$$

$n!$ is the factorial function

Now, multiplying the exact result

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\left(e^{-2A}\,k+\frac{128}{3}\,e^{-3\sqrt{2}\,\pi}\left(\frac{1}{\gamma}+2\right)h^2\right)$$

by the following Cardano’s formula

$$\sqrt[3]{-\frac{q}{2}+\sqrt{\frac{q^2}{4}+\frac{p^3}{27}}}+\sqrt[3]{-\frac{q}{2}-\sqrt{\frac{q^2}{4}+\frac{p^3}{27}}}$$

we obtain:

((2^(-1/π) (5 (3 + sqrt(5)) π)^(1/(2 π)) (e^(-2 A) k + 128/3 e^(-3 sqrt(2) π) h^2 (2 + 1/γ))))*(( ∛(-q/2+√(q^2/4+p^3/27)) +∛(-q/2-√(q^2/4+p^3/27))))

**Input**

$$\left(2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\left(e^{-2A}\,k+\frac{128}{3}\,e^{-3\sqrt{2}\,\pi}\,h^2\left(2+\frac{1}{\gamma}\right)\right)\right)\left(\sqrt[3]{-\frac{q}{2}+\sqrt{\frac{q^2}{4}+\frac{p^3}{27}}}+\sqrt[3]{-\frac{q}{2}-\sqrt{\frac{q^2}{4}+\frac{p^3}{27}}}\right)$$

$\sqrt[3]{x}$ is the real-valued 3rd root of $x$

## Exact result

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\left(\sqrt[3]{-\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}-\frac{q}{2}}+\sqrt[3]{\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}-\frac{q}{2}}\right)\left(e^{-2A}k+\frac{128}{3}e^{-3\sqrt{2}\pi}\left(\frac{1}{\gamma}+2\right)h^2\right)$$

$\sqrt[n]{x}$ is the real-valued nth root of $x$

## Alternate forms

$$-\frac{1}{3\sqrt{3}\,\gamma}2^{-1/3-1/\pi}\sqrt[2\pi]{\left(15+5\sqrt{5}\right)\pi}\left(\sqrt[3]{3\sqrt{3}\,q-\sqrt{4p^3+27q^2}}+\sqrt[3]{\sqrt{4p^3+27q^2}+3\sqrt{3}\,q}\right)\left(3e^{-2A}\gamma k+128e^{-3\sqrt{2}\pi}(2\gamma+1)h^2\right)$$

$$\frac{1}{3\gamma}2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;e^{-2A-3\sqrt{2}\pi}\left(\sqrt[3]{-\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}-\frac{q}{2}}+\sqrt[3]{\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}-\frac{q}{2}}\right)\left(256e^{2A}\gamma h^2+128e^{2A}h^2+3e^{3\sqrt{2}\pi}\gamma k\right)$$

## Expanded form

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\ e^{-2A}\,k\sqrt[3]{-\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}-\frac{q}{2}}+$$
$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\ e^{-2A}\,k\sqrt[3]{\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}-\frac{q}{2}}+$$
$$\frac{2^{7-1/\pi}\,e^{-3\sqrt{2}\,\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\ h^2\sqrt[3]{-\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}-\frac{q}{2}}}{3\gamma}+$$
$$\frac{2^{7-1/\pi}\,e^{-3\sqrt{2}\,\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\ h^2\sqrt[3]{\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}-\frac{q}{2}}}{3\gamma}+$$
$$\frac{1}{3}\times 2^{8-1/\pi}\,e^{-3\sqrt{2}\,\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\ h^2\sqrt[3]{-\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}-\frac{q}{2}}+$$
$$\frac{1}{3}\times 2^{8-1/\pi}\,e^{-3\sqrt{2}\,\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\ h^2\sqrt[3]{\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}-\frac{q}{2}}$$

## Alternate forms assuming A, h, k, p, q, and $\gamma$ are positive

$$\frac{1}{3\times 3^{2/3}\,\gamma}2^{-(3+\pi)/(3\pi)}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\ e^{-2A-3\sqrt{2}\,\pi}$$
$$\left(\sqrt[3]{\sqrt{12p^3+81q^2}-9q}-\sqrt[3]{\sqrt{12p^3+81q^2}+9q}\right)$$
$$\left(128\,e^{2A}\,(2\gamma+1)\,h^2+3\,e^{3\sqrt{2}\,\pi}\,\gamma\,k\right)$$

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;e^{-2A}\,k\,\sqrt[3]{\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}-\frac{q}{2}}\;-$$

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;e^{-2A}\,k\,\sqrt[3]{\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}+\frac{q}{2}}\;+$$

$$\frac{1}{3}\times 2^{7-1/\pi}\,e^{-3\sqrt{2}\,\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;\left(\frac{1}{\gamma}+2\right)h^2\,\sqrt[3]{\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}-\frac{q}{2}}\;-$$

$$\frac{1}{3}\times 2^{7-1/\pi}\,e^{-3\sqrt{2}\,\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;\left(\frac{1}{\gamma}+2\right)h^2\,\sqrt[3]{\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}+\frac{q}{2}}$$

**Derivative**

$$\frac{\partial}{\partial p}\left(\left(2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;\left(e^{-2A}\,k+\frac{128}{3}\,e^{-3\sqrt{2}\,\pi}\,h^2\left(2+\frac{1}{\gamma}\right)\right)\right)\left(\sqrt[3]{-\frac{q}{2}+\sqrt{\frac{q^2}{4}+\frac{p^3}{27}}}+\sqrt[3]{-\frac{q}{2}-\sqrt{\frac{q^2}{4}+\frac{p^3}{27}}}\right)\right)=2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}$$

$$\left(\frac{p^2}{54\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}\;\sqrt[3]{\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}-\frac{q}{2}}^{\,2}}-\frac{p^2}{54\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}\;\sqrt[3]{-\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}-\frac{q}{2}}^{\,2}}\right)$$

$$\left(e^{-2A}\,k+\frac{128}{3}\,e^{-3\sqrt{2}\,\pi}\left(\frac{1}{\gamma}+2\right)h^2\right)$$

From the exact result

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\;\left(\sqrt[3]{-\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}-\frac{q}{2}}+\sqrt[3]{\sqrt{\frac{p^3}{27}+\frac{q^2}{4}}-\frac{q}{2}}\right)\left(e^{-2A}\,k+\frac{128}{3}\right.$$

$$\left.e^{-3\sqrt{2}\,\pi}\left(\frac{1}{\gamma}+2\right)h^2\right)$$

2^(-1/π) (5 (3 + sqrt(5)) π)^(1/(2 π)) (e^(-2 A) k + 128/3 e^(-3 sqrt(2) π) h^2 (2 + 1/γ)) ((-q/2 - sqrt(p^3/27 + q^2/4))^(1/3) + (-q/2 + sqrt(p^3/27 + q^2/4))^(1/3))

for p = 2 and q = 3, k = 4 and A = 8, h = 16:

2^(-1/π) (5 (3 + sqrt(5)) π)^(1/(2 π)) (e^(-2*8) 4 + 128/3 e^(-3 sqrt(2) π) 16^2 (2 + 1/0.57721)) ((-3/2 - sqrt(2^3/27 + 3^2/4))^(1/3) + (-3/2 + sqrt(2^3/27 + 3^2/4))^(1/3))

**Input**

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\left(e^{-2\times 8}\times 4+\frac{128}{3}\,e^{-3\sqrt{2}\,\pi}\times 16^2\left(2+\frac{1}{0.57721}\right)\right)$$
$$\left(\sqrt[3]{-\frac{3}{2}-\sqrt{\frac{2^3}{27}+\frac{3^2}{4}}}+\sqrt[3]{-\frac{3}{2}+\sqrt{\frac{2^3}{27}+\frac{3^2}{4}}}\right)$$

**Result**

0.127317… +
0.135478… $i$

**Alternate complex forms**

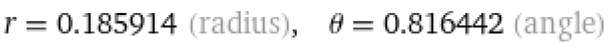
$0.127317 + 0.135478\,i$

$0.185914\,(\cos(0.816442) + i\sin(0.816442))$

$0.185914\,e^{0.816442\,i}$

$i$ is the imaginary unit

**Polar coordinates**



$r = 0.185914$ (radius), $\theta = 0.816442$ (angle)

0.185914 is very near to the value of CMRB that is equal to 0.187859642

## Series representations

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\left(e^{-2\times 8}\,4+\frac{1}{3}\,e^{-3\sqrt{2}\,\pi}\,128\times 16^{2}\left(2+\frac{1}{0.57721}\right)\right)$$

$$\left(\sqrt[3]{-\frac{3}{2}-\sqrt{\frac{2^{3}}{27}+\frac{3^{2}}{4}}}+\sqrt[3]{-\frac{3}{2}+\sqrt{\frac{2^{3}}{27}+\frac{3^{2}}{4}}}\right)=$$

$$3.1748\times 2^{-1/\pi}\exp\left(-16-3\,\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}\right)$$

$$\left(10\,192.1\sqrt[2\pi]{5}\;e^{16}\sqrt[3]{-3-2\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{275}{108}-z_0\right)^k z_0^{-k}}{k!}}\right.$$

$$\sqrt[2\pi]{\pi\left(3+\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}\right)}+$$

$$\sqrt[2\pi]{5}\,\exp\left(3\,\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}\right)$$

$$\sqrt[3]{-3-2\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{275}{108}-z_0\right)^k z_0^{-k}}{k!}}$$

$$\sqrt[2\pi]{\pi\left(3+\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}\right)}+$$

$$10\,192.1\sqrt[2\pi]{5}\;e^{16}\sqrt[3]{-3+2\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{275}{108}-z_0\right)^k z_0^{-k}}{k!}}$$

$$\sqrt[2\pi]{\pi\left(3+\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}\right)}+$$

$$\sqrt[2\pi]{5}\,\exp\left(3\,\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}\right)$$

$$\sqrt[3]{-3+2\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{275}{108}-z_0\right)^k z_0^{-k}}{k!}}$$

$$\left.\sqrt[2\pi]{\pi\left(3+\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}\right)}\right)$$

for (not ($z_0\in\mathbb{R}$ and $-\infty<z_0\leq 0$))

$$\begin{aligned}
&2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\left(e^{-2\times 8}\,4+\frac{1}{3}e^{-3\sqrt{2}\,\pi}\,128\times 16^2\left(2+\frac{1}{0.57721}\right)\right)\\
&\left(\sqrt[3]{-\frac{3}{2}-\sqrt{\frac{2^3}{27}+\frac{3^2}{4}}}+\sqrt[3]{-\frac{3}{2}+\sqrt{\frac{2^3}{27}+\frac{3^2}{4}}}\right)=\\
&3.1748\times 2^{-1/\pi}\,e^{-16-3\pi\exp\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}\,\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}\left(10192.1\sqrt[2\pi]{5}\,e^{16}\right.\\
&\sqrt[3]{-3-2\exp\left(i\pi\left\lfloor\frac{\arg\left(\frac{275}{108}-x\right)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\left(\frac{275}{108}-x\right)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}\\
&\sqrt[2\pi]{\pi\left(3+\exp\left(i\pi\left\lfloor\frac{\arg(5-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(5-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)}+\\
&\sqrt[2\pi]{5}\,e^{3\pi\exp\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}\,\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}\\
&\sqrt[3]{-3-2\exp\left(i\pi\left\lfloor\frac{\arg\left(\frac{275}{108}-x\right)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\left(\frac{275}{108}-x\right)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}\\
&\sqrt[2\pi]{\pi\left(3+\exp\left(i\pi\left\lfloor\frac{\arg(5-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(5-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)}+\\
&10192.1\sqrt[2\pi]{5}\,e^{16}\\
&\sqrt[3]{-3+2\exp\left(i\pi\left\lfloor\frac{\arg\left(\frac{275}{108}-x\right)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\left(\frac{275}{108}-x\right)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}\\
&\sqrt[2\pi]{\pi\left(3+\exp\left(i\pi\left\lfloor\frac{\arg(5-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(5-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)}+\\
&\sqrt[2\pi]{5}\,e^{3\pi\exp\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}\,\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}\\
&\sqrt[3]{-3+2\exp\left(i\pi\left\lfloor\frac{\arg\left(\frac{275}{108}-x\right)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\left(\frac{275}{108}-x\right)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}\\
&\left.\sqrt[2\pi]{\pi\left(3+\exp\left(i\pi\left\lfloor\frac{\arg(5-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(5-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)}\right)
\end{aligned}$$

for ($x \in \mathbb{R}$ and $x < 0$)

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\,\left(e^{-2\times 8}\,4+\frac{1}{3}\,e^{-3\sqrt{2}\,\pi}\,128\times 16^{2}\left(2+\frac{1}{0.57721}\right)\right)$$

$$\left(\sqrt[3]{-\frac{3}{2}-\sqrt{\frac{2^{3}}{27}+\frac{3^{2}}{4}}}+\sqrt[3]{-\frac{3}{2}+\sqrt{\frac{2^{3}}{27}+\frac{3^{2}}{4}}}\right)=3.1748\times 2^{-1/\pi}$$

$$e^{-16-3\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor}\,z_0^{1/2+1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor}\,\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}$$

$$\Bigg(10\,192.1\,\sqrt[2\pi]{5}\,e^{16}\Bigg(-3-2\left(\frac{1}{z_0}\right)^{1/2\left\lfloor\arg\left(\frac{275}{108}-z_0\right)/(2\pi)\right\rfloor}\,z_0^{1/2+1/2\left\lfloor\arg\left(\frac{275}{108}-z_0\right)/(2\pi)\right\rfloor}$$

$$\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{275}{108}-z_0\right)^k z_0^{-k}}{k!}\Bigg)\,\hat{}\,(1/3)$$

$$\Bigg(\pi\Bigg(3+\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}\,z_0^{1/2+1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}$$

$$\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}\Bigg)\Bigg)\,\hat{}\,\left(\frac{1}{2\pi}\right)+$$

$$\sqrt[2\pi]{5}\,e^{3\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor}\,z_0^{1/2+1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor}\,\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}$$

$$\Bigg(-3-2\left(\frac{1}{z_0}\right)^{1/2\left\lfloor\arg\left(\frac{275}{108}-z_0\right)/(2\pi)\right\rfloor}\,z_0^{1/2+1/2\left\lfloor\arg\left(\frac{275}{108}-z_0\right)/(2\pi)\right\rfloor}$$

$$\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{275}{108}-z_0\right)^k z_0^{-k}}{k!}\Bigg)\,\hat{}\,(1/3)$$

$$\Bigg(\pi\Bigg(3+\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}\,z_0^{1/2+1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}$$

$$\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}\Bigg)\Bigg)\,\hat{}\,\left(\frac{1}{2\pi}\right)+$$

$$10\,192.1\,\sqrt[2\pi]{5}\,e^{16}\Bigg(-3+2\left(\frac{1}{z_0}\right)^{1/2\left\lfloor\arg\left(\frac{275}{108}-z_0\right)/(2\pi)\right\rfloor}\,z_0^{1/2+1/2\left\lfloor\arg\left(\frac{275}{108}-z_0\right)/(2\pi)\right\rfloor}$$

$$\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{275}{108}-z_0\right)^k z_0^{-k}}{k!}\Bigg)\,\hat{}\,(1/3)$$

$$\Bigg(\pi\Bigg(3+\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}\,z_0^{1/2+1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}$$

$$\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}\Bigg)\Bigg)\,\hat{}\,\left(\frac{1}{2\pi}\right)+$$

$$\sqrt[2\pi]{5}\,e^{3\pi\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor}\,z_0^{1/2+1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor}\,\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}$$

$$\Bigg(-3+2\left(\frac{1}{z_0}\right)^{1/2\left\lfloor\arg\left(\frac{275}{108}-z_0\right)/(2\pi)\right\rfloor}\,z_0^{1/2+1/2\left\lfloor\arg\left(\frac{275}{108}-z_0\right)/(2\pi)\right\rfloor}$$

$$\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{275}{108}-z_0\right)^k z_0^{-k}}{k!}\Bigg)\,\hat{}\,(1/3)$$

$$\Bigg(\pi\Bigg(3+\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}\,z_0^{1/2+1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}$$

$$\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}\Bigg)\Bigg)\,\hat{}\,\left(\frac{1}{2\pi}\right)\Bigg)$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

$\mathbb{R}$ is the set of real numbers

$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

From which, after some calculations:

(8+1/√2)(2^(-1/π) (5 (3 + sqrt(5)) π)^(1/(2 π)) (e^(-2*8) 4 + 128/3 e^(-3 sqrt(2) π) 16^2 (2 + 1/0.57721)) ((-3/2 - sqrt(2^3/27 + 3^2/4))^(1/3) + (-3/2 + sqrt(2^3/27 + 3^2/4))^(1/3)))

## Input

$$\left(8+\frac{1}{\sqrt{2}}\right)\left(2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\left(e^{-2\times 8}\times 4+\frac{128}{3}e^{-3\sqrt{2}\pi}\times 16^2\left(2+\frac{1}{0.57721}\right)\right)\left(\sqrt[3]{-\frac{3}{2}-\sqrt{\frac{2^3}{27}+\frac{3^2}{4}}}+\sqrt[3]{-\frac{3}{2}+\sqrt{\frac{2^3}{27}+\frac{3^2}{4}}}\right)\right)$$

## Result

$1.10856\ldots +$
$1.17962\ldots\, i$

## Alternate complex forms

$1.10856 + 1.17962\, i$

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$1.61877\,(\cos(0.816442) + i\sin(0.816442))$

$1.61877\, e^{0.816442\, i}$

$i$ is the imaginary unit

## Polar coordinates

$r = 1.61877$ (radius), $\theta = 0.816442$ (angle)

1.61877 result that is a very good approximation to the value of the golden ratio 1.618033988749… (Ramanujan Recurring Number)

## Series representations

$$\left(8+\frac{1}{\sqrt{2}}\right)2^{-1/\pi}\left(\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\left(e^{-2\times 8}\, 4+\frac{1}{3}\, e^{-3\sqrt{2}\,\pi}\, 128\times 16^2\left(2+\frac{1}{0.57721}\right)\right)\right.$$
$$\left.\left(\sqrt[3]{-\frac{3}{2}-\sqrt{\frac{2^3}{27}+\frac{3^2}{4}}}+\sqrt[3]{-\frac{3}{2}+\sqrt{\frac{2^3}{27}+\frac{3^2}{4}}}\right)\right)=$$
$$2^{-1/\pi}\sqrt[2\pi]{5}\left(\frac{4}{e^{16}}+40768.5\exp\left(-3\pi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}\right)\right)$$
$$\left(8+\frac{1}{\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}\right)$$
$$\left(\sqrt[3]{-\frac{3}{2}-\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{275}{108}-z_0\right)^k z_0^{-k}}{k!}}+\right.$$
$$\left.\sqrt[3]{-\frac{3}{2}+\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{275}{108}-z_0\right)^k z_0^{-k}}{k!}}\right)$$
$$\sqrt[2\pi]{\pi\left(3+\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}\right)}$$

for (not ($z_0 \in \mathbb{R}$ and $-\infty < z_0 \leq 0$))

$$\left(8+\frac{1}{\sqrt{2}}\right)2^{-1/\pi}\left(\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\,\left(e^{-2\times 8}\,4+\frac{1}{3}\,e^{-3\sqrt{2}\,\pi}\,128\times 16^2\left(2+\frac{1}{0.57721}\right)\right)\right.$$
$$\left.\left(\sqrt[3]{-\frac{3}{2}-\sqrt{\frac{2^3}{27}+\frac{3^2}{4}}}+\sqrt[3]{-\frac{3}{2}+\sqrt{\frac{2^3}{27}+\frac{3^2}{4}}}\right)\right)=$$
$$2^{-1/\pi}\,\sqrt[2\pi]{5}\left(\frac{4}{e^{16}}+40\,768.5\exp\left(-3\,\pi\exp\left(i\,\pi\left\lfloor\frac{\arg(2-x)}{2\,\pi}\right\rfloor\right)\right.\right.$$
$$\left.\left.\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\,(2-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)\right)$$
$$\left(8+\frac{1}{\exp\left(i\,\pi\left\lfloor\frac{\arg(2-x)}{2\,\pi}\right\rfloor\right)\sqrt{x}\,\sum_{k=0}^{\infty}\frac{(-1)^k\,(2-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}\right)$$
$$\left(\sqrt[3]{-\frac{3}{2}-\exp\left(i\,\pi\left\lfloor\frac{\arg\left(\frac{275}{108}-x\right)}{2\,\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\left(\frac{275}{108}-x\right)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}+\right.$$
$$\left.\sqrt[3]{-\frac{3}{2}+\exp\left(i\,\pi\left\lfloor\frac{\arg\left(\frac{275}{108}-x\right)}{2\,\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\left(\frac{275}{108}-x\right)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}\right)$$
$$\sqrt[2\pi]{\pi\left(3+\exp\left(i\,\pi\left\lfloor\frac{\arg(5-x)}{2\,\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\,(5-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)}$$

for ($x \in \mathbb{R}$ and $x < 0$)

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$$\left(8+\frac{1}{\sqrt{2}}\right)2^{-1/\pi}\left(\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\,\left(e^{-2\times 8}\,4+\frac{1}{3}\,e^{-3\sqrt{2}\,\pi}\,128\times 16^{2}\left(2+\frac{1}{0.57721}\right)\right)\right.$$

$$\left.\left(\sqrt[3]{-\frac{3}{2}-\sqrt{\frac{2^{3}}{27}+\frac{3^{2}}{4}}}+\sqrt[3]{-\frac{3}{2}+\sqrt{\frac{2^{3}}{27}+\frac{3^{2}}{4}}}\right)\right)=$$

$$2^{-1/\pi}\,\sqrt[2\pi]{5}\left(\frac{4}{e^{16}}+40\,768.5\exp\left(-3\,\pi\left(\frac{1}{z_0}\right)^{1/2\,\lfloor\arg(2-z_0)/(2\,\pi)\rfloor}\right.\right.$$

$$\left.\left.z_0^{1/2\,(1+\lfloor\arg(2-z_0)/(2\,\pi)\rfloor)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k\,z_0^{-k}}{k!}\right)\right)$$

$$\left(8+\frac{\left(\frac{1}{z_0}\right)^{-1/2\,\lfloor\arg(2-z_0)/(2\,\pi)\rfloor}\,z_0^{1/2\,(-1-\lfloor\arg(2-z_0)/(2\,\pi)\rfloor)}}{\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k\,z_0^{-k}}{k!}}\right)$$

$$\left(\left(-\frac{3}{2}-\left(\frac{1}{z_0}\right)^{1/2\left\lfloor\arg\left(\frac{275}{108}-z_0\right)/(2\,\pi)\right\rfloor}z_0^{1/2\left(1+\left\lfloor\arg\left(\frac{275}{108}-z_0\right)/(2\,\pi)\right\rfloor\right)}\right.\right.$$

$$\left.\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{275}{108}-z_0\right)^k z_0^{-k}}{k!}\right)\hat{}\,(1/3)+$$

$$\left(-\frac{3}{2}+\left(\frac{1}{z_0}\right)^{1/2\left\lfloor\arg\left(\frac{275}{108}-z_0\right)/(2\,\pi)\right\rfloor}z_0^{1/2\left(1+\left\lfloor\arg\left(\frac{275}{108}-z_0\right)/(2\,\pi)\right\rfloor\right)}\right.$$

$$\left.\left.\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{275}{108}-z_0\right)^k z_0^{-k}}{k!}\right)\hat{}\,(1/3)\right)$$

$$\left(\pi\left(3+\left(\frac{1}{z_0}\right)^{1/2\,\lfloor\arg(5-z_0)/(2\,\pi)\rfloor}z_0^{1/2\,(1+\lfloor\arg(5-z_0)/(2\,\pi)\rfloor)}\right.\right.$$

$$\left.\left.\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\,z_0^{-k}}{k!}\right)\right)\hat{}\left(\frac{1}{2\,\pi}\right)$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

$\mathbb{R}$ is the set of real numbers

$\arg(z)$ is the complex argument

$\lfloor x\rfloor$ is the floor function

From

**Modular equations and approximations to π** – *Srinivasa Ramanujan* - Quarterly Journal of Mathematics, XLV, 1914, 350 – 372

We analyze the following Ramanujan modular equation:

$$G_{65} = \left\{ \left( \frac{1+\sqrt{5}}{2} \right) \left( \frac{3+\sqrt{13}}{2} \right) \right\}^{\frac{1}{4}} \sqrt{ \left\{ \sqrt{ \left( \frac{9+\sqrt{65}}{8} \right) } + \sqrt{ \left( \frac{1+\sqrt{65}}{8} \right) } \right\} }.$$

(((1+sqrt5)/2)((3+sqrt13)/2))^1/4*sqrt(((1/8(9+sqrt65))^1/2)+ (1/8(1+sqrt65))^1/2)

and observing that:

$$\left. \begin{aligned} \pi &= \frac{24}{\sqrt{n}} \log(2^{\frac{1}{4}} G_n) \\ \pi &= \frac{24}{\sqrt{n}} \log(2^{\frac{1}{4}} g_n) \end{aligned} \right\}$$

we obtain

24/(sqrt65)*ln(2^(1/4)*((((1+sqrt5)/2)((3+sqrt13)/2))^1/4*sqrt(((1/8(9+sqrt65))^1/2) + (1/8(1+sqrt65))^1/2)))

$$\frac{24 \log\left( \sqrt[4]{\frac{1}{2} \left(1+\sqrt{5}\right) \left(3+\sqrt{13}\right)} \sqrt{ \frac{1}{2} \sqrt{\frac{1}{2} \left(1+\sqrt{65}\right)} + \frac{1}{2} \sqrt{\frac{1}{2} \left(9+\sqrt{65}\right)} } \right)}{\sqrt{65}}$$

= 3.141592653619…

From the previous already calculated formula

$$\sqrt[18]{(\pi \log(-(6.47\times 10^{565})\, i) + 3) + \left(27 \sqrt{\pi \log(-(6.47\times 10^{565})\, i) + 3} + 1\right)}$$

1.618761588… −
0.00009225933346… $i$

substituting in the following Ramanujan modular equations

$$\frac{24 \log\left(\sqrt[4]{\frac{1}{2}\left(1+\sqrt{5}\right)\left(3+\sqrt{13}\right)} \sqrt{\frac{1}{2}\sqrt{\frac{1}{2}\left(1+\sqrt{65}\right)} + \frac{1}{2}\sqrt{\frac{1}{2}\left(9+\sqrt{65}\right)}}\right)}{\sqrt{65}}$$

this result

1.618761588… −
0.00009225933346… $i$

instead of 1/2(1+√5), we obtain:

24/(sqrt65)*ln(2^(1/4)*(((((1.618761588-0.00009225933346i))((3+sqrt13)/2))^1/4*sqrt(((1/8(9+sqrt65))^1/2)+(1/8(1+sqrt65))^1/2))))

**Input interpretation**

$$\frac{24}{\sqrt{65}} \log\left(\sqrt[4]{2}\left(\sqrt[4]{(1.618761588 + i\times(-0.00009225933346))\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)} \sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)} + \sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)$$

log($x$) is the natural logarithm

$i$ is the imaginary unit

## Result

3.1419272360… −
0.000042415246364… $i$

## Alternate complex forms

$3.14193 - 0.0000424152\, i$

$3.14193\,(\cos(-0.0000134998) + i \sin(-0.0000134998))$

$3.14193\, e^{-0.0000134998\, i}$

## Polar coordinates

$r = 3.14193$ (radius), $\theta = -0.0000134998$ (angle)

3.14193 ≈ π (Ramanujan Recurring Number)

## Alternative representations

$$\frac{1}{\sqrt{65}} \log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}(1.61876 - i\, 0.0000922593)\left(3+\sqrt{13}\right)} \sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)} + \sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right) 24 =$$

$$\frac{1}{\sqrt{65}}\, 24 \log_e\left(\sqrt[4]{2}\, \sqrt[4]{\frac{1}{2}(1.61876 - 0.0000922593\, i)\left(3+\sqrt{13}\right)} \sqrt{\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)} + \sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}}\right)$$

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$$\frac{1}{\sqrt{65}}\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}(1.61876 - i\,0.0000922593)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)24 =$$

$$\frac{1}{\sqrt{65}}24\log(a)\log_a\left(\sqrt[4]{2}\sqrt[4]{\frac{1}{2}(1.61876 - 0.0000922593\,i)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}}\right)$$

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$$\frac{1}{\sqrt{65}}\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}(1.61876 - i\,0.0000922593)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)24 =$$

$$-\frac{1}{\sqrt{65}}24\operatorname{Li}_1\left(1-\sqrt[4]{2}\sqrt[4]{\frac{1}{2}(1.61876 - 0.0000922593\,i)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}}\right)$$

$\log_b(x)$ is the base- $b$ logarithm

$\operatorname{Li}_n(x)$ is the polylogarithm function

## Series representations

$$\frac{1}{\sqrt{65}}\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}(1.61876-i\,0.0000922593)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)24=$$

$$\left(24\left(\log\left(-1+\sqrt[4]{(1.61876-0.0000922593\,i)\left(3+\sqrt{13}\right)}\sqrt{\frac{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}{2\sqrt{2}}}\right)-\sum_{k=1}^{\infty}\frac{1}{k}(-1)^k\left(-1+\sqrt[4]{(1.61876-0.0000922593\,i)\left(3+\sqrt{13}\right)}\sqrt{\frac{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}{2\sqrt{2}}}\right)^{-k}\right)\right)\Big/\left(\sqrt{64}\sum_{k=0}^{\infty}64^{-k}\binom{\frac{1}{2}}{k}\right)$$

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$$
\begin{aligned}
&\frac{1}{\sqrt{65}} \log\left(\sqrt[4]{2} \left(\sqrt[4]{\frac{1}{2} (1.61876 - i\, 0.0000922593) \left(3 + \sqrt{13}\right)}\right.\right. \\
&\qquad \left.\left.\sqrt{\sqrt{\frac{1}{8} \left(9 + \sqrt{65}\right)} + \sqrt{\frac{1}{8} \left(1 + \sqrt{65}\right)}}\right)\right) 24 = \\
&\left(24 \log\left(\sqrt{\frac{1}{4} \left(-4 + \sqrt{2}\, \sqrt{1 + \sqrt{65}} + \sqrt{2}\, \sqrt{9 + \sqrt{65}}\right)}\right.\right. \\
&\qquad \sqrt[4]{(1.61876 - 0.0000922593\, i) \left(3 + \sqrt{12}\, \sum_{k=0}^{\infty} 12^{-k} \binom{\frac{1}{2}}{k}\right)} \\
&\qquad \left.\left.\sum_{k=0}^{\infty} 4^{k} \binom{\frac{1}{2}}{k} \left(-4 + \sqrt{2}\, \sqrt{1 + \sqrt{65}} + \sqrt{2}\, \sqrt{9 + \sqrt{65}}\right)^{-k}\right)\right) \Big/ \\
&\left(\sqrt{64}\, \sum_{k=0}^{\infty} 64^{-k} \binom{\frac{1}{2}}{k}\right)
\end{aligned}
$$

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$$\frac{1}{\sqrt{65}}\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}(1.61876-i\,0.0000922593)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)24 =$$

$$\left(24\left(\log\left(-1+\sqrt[4]{(1.61876-0.0000922593\,i)\left(3+\sqrt{13}\right)}\sqrt{\frac{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}{2\sqrt{2}}}\right)-\right.\right.$$

$$\left.\left.\sum_{k=1}^{\infty}\frac{1}{k}(-1)^k\left(-1+\sqrt[4]{(1.61876-0.0000922593\,i)\left(3+\sqrt{13}\right)}\sqrt{\frac{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}{2\sqrt{2}}}\right)^{-k}\right)\right)/$$

$$\left(\exp\left(\pi\mathcal{A}\left\lfloor\frac{\arg(65-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(65-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)$$

for ($x \in \mathbb{R}$ and $x < 0$)

$\binom{n}{m}$ is the binomial coefficient

$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

$\mathbb{R}$ is the set of real numbers

## Unitary Formula

We have the following equations:

Schrodinger equation:

$$ih\frac{\partial\Psi}{\partial t} = -\frac{h^2}{2m}\cdot\frac{\partial^2\Psi}{\partial x^2} + V\Psi$$

Einstein Field Equation:

$$R_{\mu\nu} - \frac{1}{2}R\,g_{\mu\nu} + \Lambda\,g_{\mu\nu} = \frac{8\pi G}{c^4}T_{\mu\nu}$$

Heisenberg's uncertainty principle can be expressed in terms of the following operators:

$[\hat{x},\hat{p}]\,\psi(x)=i\,\hbar\,\psi(x)$

### Dirac Equation positive and negative frequency plane wave solution

$$\psi^+(x) = \frac{\gamma^\nu p_\nu + m}{\sqrt{2m(m+E)}}u_s e^{-ip\cdot x}$$

$$\psi^-(x) = \frac{-\gamma^\nu p_\nu + m}{\sqrt{2m(m+E)}}v_s e^{ip\cdot x}$$

We consider the right-hand side of the second formula

$$\frac{-\gamma^{v}p+m}{\sqrt{2m(m+E)}}v\cdot e^{ip\cdot x}$$

## Planck equation concerning the spectral energy density at given temperature

$$u_{\nu}(\nu,T)=\frac{8\pi h\nu^{3}}{c^{3}}\frac{1}{\exp\left(\frac{h\nu}{k_{\mathrm{B}}T}\right)-1}$$

We consider the right-hand side of the above formula

$$\frac{8\pi h\nu^{3}}{c^{3}}\frac{1}{exp\left(\frac{h\nu}{kT}\right)-1}$$

## 11-dimensional supergravity action

$$S_{\text{supergravity}}=\frac{1}{2\kappa_{11}^{2}}\int d^{11}x\sqrt{-g}\left(\mathcal{R}-\frac{1}{48}F_{\mu\nu\lambda\rho}F^{\mu\nu\lambda\rho}\right)$$

where

$$\kappa_{11}=(8\pi)^{\frac{2}{3}}\,\ell_{\text{Planck}}^{9}$$

In conclusion, we obtain following Unitary Formula

$$\left(-\frac{h^2}{2m}\frac{\partial^2\Psi}{\partial x^2}+V\Psi\right)\times\left(\frac{8\pi G}{c^4}T_{\mu\nu}\right)\times(i\hbar\psi(x))\times((i\hbar\gamma^{\mu}\partial_{\mu}-mc)\psi(x))\times\left(\frac{8\pi h\nu^3}{c^3\left(\exp\left(\frac{h\nu}{k_BT}\right)-1\right)}\right)\times(-3.27370\times 10^{627}i)$$

From which:

((ln(−2.37×10^531 i)+521-18+2+(2e)/11)+((1/27((ln(−2.37×10^531 i)+521-18+2+(2e)/11)-1))^2-MRB const))^1/18

$$\left(\left(\log\left(-\left(2.37\times 10^{531}\right) i\right)+521-18+2+\frac{2\,e}{11}\right)+\left(\left(\frac{1}{27}\left(\left(\log\left(-\left(2.37\times 10^{531}\right) i\right)+521-18+2+\frac{2\,e}{11}\right)-1\right)\right)^2-C_{\text{MRB}}\right)\right)\hat{}\,(1/18)$$

$1.618762187\ldots -$
$0.0001392226091\ldots\, i$

1.618762187-0.0001392226091i

**Polar coordinates**

$r = 1.61876$ (radius), $\theta = -0.0000860056$ (angle)

1.61876 result that is a very good approximation to the value of the golden ratio 1.618033988749… (Ramanujan Recurring Number) from the following Ramanujan modular equation

$$G_{65}=\left\{\left(\frac{1+\sqrt{5}}{2}\right)\left(\frac{3+\sqrt{13}}{2}\right)\right\}^{\frac{1}{4}}\sqrt{\left\{\sqrt{\left(\frac{9+\sqrt{65}}{8}\right)}+\sqrt{\left(\frac{1+\sqrt{65}}{8}\right)}\right\}}.$$

(((1+sqrt5)/2)((3+sqrt13)/2))^1/4*sqrt(((1/8(9+sqrt65))^1/2)+ (1/8(1+sqrt65))^1/2)

and observing that:

$$\left.\begin{aligned}\pi &= \frac{24}{\sqrt{n}}\log(2^{\frac{1}{4}}G_n)\\ \pi &= \frac{24}{\sqrt{n}}\log(2^{\frac{1}{4}}g_n)\end{aligned}\right\}$$

we obtain

24/(sqrt65)*ln(2^(1/4)*(((( 1.618762187-0.0001392226091i)((3+sqrt13)/2))^1/4*sqrt(((1/8(9+sqrt65))^1/2)+ (1/8(1+sqrt65))^1/2))))

**Input interpretation**

$$\frac{24}{\sqrt{65}}\log\left(\sqrt[4]{2}\left(\sqrt[4]{(1.618762187+i\times(-0.0001392226091))\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)$$

$\log(x)$ is the natural logarithm

$i$ is the imaginary unit

## Result

3.1419275130… −
0.000064006088595… $i$

## Alternate complex forms

$3.14193 - 0.0000640061\,i$

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$3.14193\,(\cos(-0.0000203716) + i\sin(-0.0000203716))$

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$3.14193\,e^{-0.0000203716\,i}$

## Polar coordinates

$r = 3.14193$ (radius), $\theta = -0.0000203716$ (angle)

3.14193 ≈ π (Ramanujan Recurring Number)

## Alternative representations

$$\frac{1}{\sqrt{65}}\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}(1.61876 - i\,0.000139223)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)24 =$$

$$\frac{1}{\sqrt{65}}\,24\log_e\left(\sqrt[4]{2}\,\sqrt[4]{\frac{1}{2}(1.61876 - 0.000139223\,i)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}}\right)$$

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$$\frac{1}{\sqrt{65}}\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}(1.61876-i\,0.000139223)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)24=$$

$$\frac{1}{\sqrt{65}}\,24\log(a)\log_a\left(\sqrt[4]{2}\,\sqrt[4]{\frac{1}{2}(1.61876-0.000139223\,i)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}}\right)$$

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$$\frac{1}{\sqrt{65}}\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}(1.61876-i\,0.000139223)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)24=$$

$$-\frac{1}{\sqrt{65}}\,24\,\mathrm{Li}_1\left(1-\sqrt[4]{2}\,\sqrt[4]{\frac{1}{2}(1.61876-0.000139223\,i)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}}\right)$$

$\log_b(x)$ is the base- $b$ logarithm

$\mathrm{Li}_n(x)$ is the polylogarithm function

## Series representations

$$\frac{1}{\sqrt{65}} \log\left(\sqrt[4]{2} \left(\sqrt[4]{\frac{1}{2} (1.61876 - i\, 0.000139223) \left(3 + \sqrt{13}\right)} \sqrt{\sqrt{\frac{1}{8} \left(9 + \sqrt{65}\right)} + \sqrt{\frac{1}{8} \left(1 + \sqrt{65}\right)}}\right)\right) 24 =$$

$$\left(24 \left(\log\left(-1 + \sqrt[4]{(1.61876 - 0.000139223\, i) \left(3 + \sqrt{13}\right)} \sqrt{\frac{\sqrt{1 + \sqrt{65}} + \sqrt{9 + \sqrt{65}}}{2 \sqrt{2}}}\right) - \sum_{k=1}^{\infty} \frac{1}{k} (-1)^k \left(-1 + \sqrt[4]{(1.61876 - 0.000139223\, i) \left(3 + \sqrt{13}\right)} \sqrt{\frac{\sqrt{1 + \sqrt{65}} + \sqrt{9 + \sqrt{65}}}{2 \sqrt{2}}}\right)^{-k}\right)\right) \bigg/$$

$$\left(\sqrt{64} \sum_{k=0}^{\infty} 64^{-k} \binom{\frac{1}{2}}{k}\right)$$

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$$\frac{1}{\sqrt{65}}\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}\,(1.61876-i\,0.000139223)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)24 =$$

$$\left(24\log\left(\sqrt{\frac{1}{4}\left(-4+\sqrt{2}\,\sqrt{1+\sqrt{65}}+\sqrt{2}\,\sqrt{9+\sqrt{65}}\right)}\sqrt[4]{(1.61876-0.000139223\,i)\left(3+\sqrt{12}\,\sum_{k=0}^{\infty}12^{-k}\binom{\frac{1}{2}}{k}\right)}\sum_{k=0}^{\infty}4^{k}\binom{\frac{1}{2}}{k}\left(-4+\sqrt{2}\,\sqrt{1+\sqrt{65}}+\sqrt{2}\,\sqrt{9+\sqrt{65}}\right)^{-k}\right)\right)\Big/\left(\sqrt{64}\,\sum_{k=0}^{\infty}64^{-k}\binom{\frac{1}{2}}{k}\right)$$

$$\frac{1}{\sqrt{65}}\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}(1.61876-i\,0.000139223)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)24=$$

$$\left(24\left(\log\left(-1+\sqrt[4]{(1.61876-0.000139223\,i)\left(3+\sqrt{13}\right)}\sqrt{\frac{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}{2\sqrt{2}}}\right)-\sum_{k=1}^{\infty}\frac{1}{k}(-1)^k\left(-1+\sqrt[4]{(1.61876-0.000139223\,i)\left(3+\sqrt{13}\right)}\sqrt{\frac{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}{2\sqrt{2}}}\right)^{-k}\right)\right)\Big/\left(\exp\left(\pi\,\mathcal{A}\left\lfloor\frac{\arg(65-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(65-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)$$

for ($x \in \mathbb{R}$ and $x < 0$)

$\binom{n}{m}$ is the binomial coefficient

$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

$\mathbb{R}$ is the set of real numbers

## Integral representations

$$\frac{1}{\sqrt{65}}\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}(1.61876-i\,0.000139223)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)24 =$$

$$\frac{24}{\sqrt{65}}\int_1^{\sqrt[4]{(1.61876-0.000139223\,i)\left(3+\sqrt{13}\right)}\sqrt{\frac{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}{2\sqrt{2}}}}\frac{1}{t}\,dt$$

$$\frac{1}{\sqrt{65}}\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}(1.61876-i\,0.000139223)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)24 =$$

$$\frac{12}{\pi\,\mathcal{A}\sqrt{65}}\int_{-\mathcal{A}\,\infty+\gamma}^{\mathcal{A}\,\infty+\gamma}\frac{1}{\Gamma(1-s)}\Gamma(-s)^2\,\Gamma(1+s)\left(-1+\sqrt[4]{(1.61876-0.000139223\,i)\left(3+\sqrt{13}\right)}\sqrt{\frac{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}{2\sqrt{2}}}\right)^{-s}ds \quad \text{for } -1<\gamma<0$$

$\Gamma(x)$ is the gamma function

And again:

1/6(24/(sqrt65)*ln(2^(1/4)*(((( 1.618762187-0.0001392226091i)((3+sqrt13)/2))^1/4*sqrt(((1/8(9+sqrt65))^1/2)+(1/8(1+sqrt65))^1/2)))))^2

## Input interpretation

$$\frac{1}{6}\left(\frac{24}{\sqrt{65}}\log\left(\sqrt[4]{2}\left(\sqrt[4]{(1.618762187+i\times(-0.0001392226091))\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)\right)^2$$

log($x$) is the natural logarithm

$i$ is the imaginary unit

## Result

$1.645284749\ldots -$
$0.00006703416358\ldots\, i$

## Alternate complex forms

$1.64528 - 0.0000670342\, i$

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$1.64528\,(\cos(-0.0000407432) + i\sin(-0.0000407432))$

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$1.64528\, e^{-0.0000407432\, i}$

## Polar coordinates

$r = 1.64528$ (radius), $\theta = -0.0000407432$ (angle)

$1.64528 \approx \zeta(2) = \pi^2/6 = 1.644934$ (trace of the instanton shape and Ramanujan Recurring Number)

## Alternative representations

$$\frac{1}{6}\left(\frac{1}{\sqrt{65}}\,24\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}\,(1.61876-i\,0.000139223)\left(3+\sqrt{13}\right)}\,\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)\right)^{2}=$$

$$\frac{1}{6}\left(\frac{1}{\sqrt{65}}\,24\log_{e}\left(\sqrt[4]{2}\,\sqrt[4]{\frac{1}{2}\,(1.61876-0.000139223\,i)\left(3+\sqrt{13}\right)}\,\sqrt{\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}}\right)\right)^{2}$$

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$$\frac{1}{6}\left(\frac{1}{\sqrt{65}}\,24\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}\,(1.61876-i\,0.000139223)\left(3+\sqrt{13}\right)}\,\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)\right)^{2}=$$

$$\frac{1}{6}\left(\frac{1}{\sqrt{65}}\,24\log(a)\log_{a}\left(\sqrt[4]{2}\,\sqrt[4]{\frac{1}{2}\,(1.61876-0.000139223\,i)\left(3+\sqrt{13}\right)}\,\sqrt{\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}}\right)\right)^{2}$$

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$$\frac{1}{6}\left(\frac{1}{\sqrt{65}}\,24\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}\,(1.61876 - i\,0.000139223)\left(3+\sqrt{13}\right)}\right.\right.\right.$$

$$\left.\left.\left.\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)\right)^2 =$$

$$\frac{1}{6}\left(-\frac{1}{\sqrt{65}}\,24\,\mathrm{Li}_1\left(1-\sqrt[4]{2}\,\sqrt[4]{\frac{1}{2}\,(1.61876 - 0.000139223\,i)\left(3+\sqrt{13}\right)}\right.\right.$$

$$\left.\left.\sqrt{\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}}\right)\right)^2$$

$\log_b(x)$ is the base- $b$ logarithm

$\mathrm{Li}_n(x)$ is the polylogarithm function

## Series representations

$$\frac{1}{6}\left(\frac{1}{\sqrt{65}}\,24\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}\,(1.61876-i\,0.000139223)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)\right)^2 =$$

$$\left(96\left(\log\left(-1+\sqrt[4]{(1.61876-0.000139223\,i)\left(3+\sqrt{13}\right)}\sqrt{\frac{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}{2\sqrt{2}}}\right)-\sum_{k=1}^{\infty}\frac{1}{k}(-1)^k\left(-1+\sqrt[4]{(1.61876-0.000139223\,i)\left(3+\sqrt{13}\right)}\sqrt{\frac{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}{2\sqrt{2}}}\right)^{-k}\right)^2\right)\Bigg/$$

$$\left(\sqrt{64}^{\,2}\left(\sum_{k=0}^{\infty}64^{-k}\binom{\frac{1}{2}}{k}\right)^2\right)$$

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$$\frac{1}{6}\left(\frac{1}{\sqrt{65}}\,24\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}\,(1.61876-i\,0.000139223)\left(3+\sqrt{13}\right)}\,\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)\right)^2=$$

$$\left(96\log^2\left(\sqrt{\frac{1}{4}\left(-4+\sqrt{2}\,\sqrt{1+\sqrt{65}}+\sqrt{2}\,\sqrt{9+\sqrt{65}}\right)}\,\sqrt[4]{(1.61876-0.000139223\,i)\left(3+\sqrt{12}\,\sum_{k=0}^{\infty}12^{-k}\binom{\frac{1}{2}}{k}\right)}\,\sum_{k=0}^{\infty}4^k\binom{\frac{1}{2}}{k}\left(-4+\sqrt{2}\,\sqrt{1+\sqrt{65}}+\sqrt{2}\,\sqrt{9+\sqrt{65}}\right)^{-k}\right)\right)\Big/\left(\sqrt{64}^{\,2}\left(\sum_{k=0}^{\infty}64^{-k}\binom{\frac{1}{2}}{k}\right)^2\right)$$

---

$$\frac{1}{6}\left(\frac{1}{\sqrt{65}}\,24\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}\,(1.61876-i\,0.000139223)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)\right)^2=$$

$$\left(96\left(\log\left(-1+\sqrt[4]{(1.61876-0.000139223\,i)\left(3+\sqrt{13}\right)}\sqrt{\frac{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}{2\sqrt{2}}}\right)-\sum_{k=1}^{\infty}\frac{1}{k}\,(-1)^k\left(-1+\sqrt[4]{(1.61876-0.000139223\,i)\left(3+\sqrt{13}\right)}\sqrt{\frac{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}{2\sqrt{2}}}\right)^{-k}\right)^2\right)\Big/$$

$$\left(\exp^2\left(\pi\,\mathcal{A}\left\lfloor\frac{\arg(65-x)}{2\pi}\right\rfloor\right)\sqrt{x}^2\left(\sum_{k=0}^{\infty}\frac{(-1)^k\,(65-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^2\right)$$

for
$(x\in\mathbb{R}$
and
$x<0)$

$\binom{n}{m}$ is the binomial coefficient

$\arg(z)$ is the complex argument

$\lfloor x\rfloor$ is the floor function

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

$\mathbb{R}$ is the set of real numbers

## Integral representations

$$\frac{1}{6}\left(\frac{1}{\sqrt{65}}\,24\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}\,(1.61876-i\,0.000139223)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)\right)^2 = \frac{96\left(\int_1^{\sqrt[4]{(1.61876-0.000139223\,i)\left(3+\sqrt{13}\right)}\sqrt{\frac{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}{2\sqrt{2}}}}\frac{1}{t}\,dt\right)^2}{\sqrt{65}^{\,2}}$$

$$\frac{1}{6}\left(\frac{1}{\sqrt{65}}\,24\log\left(\sqrt[4]{2}\left(\sqrt[4]{\frac{1}{2}\,(1.61876-i\,0.000139223)\left(3+\sqrt{13}\right)}\sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)}+\sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)\right)^2 = \frac{1}{\pi^2\,\mathcal{A}^2\,\sqrt{65}^{\,2}}\,24\left(\int_{-\mathcal{A}\,\infty+\gamma}^{\mathcal{A}\,\infty+\gamma}\frac{1}{\Gamma(1-s)}\,\Gamma(-s)^2\,\Gamma(1+s)\left(-1+\sqrt[4]{(1.61876-0.000139223\,i)\left(3+\sqrt{13}\right)}\sqrt{\frac{\sqrt{1+\sqrt{65}}+\sqrt{9+\sqrt{65}}}{2\sqrt{2}}}\right)^{-s}ds\right)^2 \quad \text{for } -1<\gamma<0$$

$\Gamma(x)$ is the gamma function

From which:

sqrt(1/(1.64528 (cos(-0.0000407432) + i sin(-0.0000407432)))*(4/3))

## Input interpretation

$$\sqrt{\frac{1}{1.64528\,(\cos(-0.0000407432) + i\sin(-0.0000407432))} \times \frac{4}{3}}$$

$i$ is the imaginary unit

## Result

$0.9002216616762889082480707761453633434879302391717660530676\ldots + 0.00001833895560554158873721357579580309328792066335073028649062\ldots\, i$

## Alternate complex forms

$0.900222\,(\cos(0.0000203716) + i\sin(0.0000203716))$

$0.900222\,e^{0.0000203716\,i}$

## Polar coordinates

$r = 0.900222$ (radius), $\theta = 0.0000203716$ (angle)

0.900222

## Possible closed form

$\frac{2\sqrt{2}}{\pi} \approx 0.90031631$

that is equal to the DN Constant

## All 2nd roots of 0.810399+0.0000330183 i

$0.900222\, e^{0.0000203716\, i} \approx 0.90022 + 0.000018339\, i$ (principal root)

$0.900222\, e^{-3.14157\, i} \approx -0.90022 - 0.000018339\, i$

## Alternative representations

$$\sqrt{\frac{4}{3\,(1.64528\,(\cos(-0.0000407432) + i \sin(-0.0000407432)))}} = \sqrt{\frac{4}{3\left(1.64528\left(\cosh(-0.0000407432\, i) + i \cos\left(0.0000407432 + \frac{\pi}{2}\right)\right)\right)}}$$

---

$$\sqrt{\frac{4}{3\,(1.64528\,(\cos(-0.0000407432) + i \sin(-0.0000407432)))}} = \sqrt{\frac{4}{3\left(1.64528\left(\cosh(0.0000407432\, i) + i \cos\left(0.0000407432 + \frac{\pi}{2}\right)\right)\right)}}$$

---

$$\sqrt{\frac{4}{3\,(1.64528\,(\cos(-0.0000407432) + i \sin(-0.0000407432)))}} = \sqrt{\frac{4}{3\left(1.64528\left(\cosh(0.0000407432\, i) - i \cos\left(-0.0000407432 + \frac{\pi}{2}\right)\right)\right)}}$$

$\cosh(x)$ is the hyperbolic cosine function

## Series representations

$$\sqrt{\frac{4}{3\,(1.64528\,(\cos(-0.0000407432) + i \sin(-0.0000407432)))}} = \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(-1 + \frac{0.810399}{\cos(-0.0000407432) + i \sin(-0.0000407432)}\right)^k}{k!}$$

$$\sqrt{\frac{4}{3\,(1.64528\,(\cos(-0.0000407432) + i\sin(-0.0000407432)))}} = \exp\left(\pi\,\mathcal{A}\left\lfloor\frac{\arg\left(-x + \frac{0.810399}{\cos(-0.0000407432)+i\sin(-0.0000407432)}\right)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k\,x^{-k}\left(-\frac{1}{2}\right)_k\left(-x + \frac{0.810399}{\cos(-0.0000407432)+i\sin(-0.0000407432)}\right)^k}{k!}$$

for ($x \in \mathbb{R}$ and $x < 0$)

---

$$\sqrt{\frac{4}{3\,(1.64528\,(\cos(-0.0000407432) + i\sin(-0.0000407432)))}} = \left(\frac{1}{z_0}\right)^{1/2\left\lfloor\arg\left(\frac{0.810399}{\cos(-0.0000407432)+i\sin(-0.0000407432)}-z_0\right)/(2\pi)\right\rfloor} z_0^{1/2\left(1+\left\lfloor\arg\left(\frac{0.810399}{\cos(-0.0000407432)+i\sin(-0.0000407432)}-z_0\right)/(2\pi)\right\rfloor\right)}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(\frac{0.810399}{\cos(-0.0000407432)+i\sin(-0.0000407432)} - z_0\right)^k z_0^{-k}}{k!}$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

$\mathbb{R}$ is the set of real numbers

## Integral representations

$$\sqrt{\frac{4}{3\,(1.64528\,(\cos(-0.0000407432) + i\sin(-0.0000407432)))}} = \sqrt{\left(0.810399\Big/\left(1 + \int_0^1(-0.0000407432\,i\cos(-0.0000407432\,t) + 0.0000407432\sin(-0.0000407432\,t))\,dt\right)\right)}$$

$$\sqrt{\frac{4}{3\,(1.64528\,(\cos(-0.0000407432) + i\sin(-0.0000407432)))}} = \sqrt{\left(-\left(19\,890.4 \middle/ \left(\int_0^1 \left(i\cos(-0.0000407432\,t) - 12\,272.\,(0.0000814864 + \pi)\sin\left(0 - \frac{1}{2}\pi\,(-1+t) - 0.0000407432\,t\right)\right)dt\right)\right)\right)}$$

$$\sqrt{\frac{4}{3\,(1.64528\,(\cos(-0.0000407432) + i\sin(-0.0000407432)))}} = \sqrt{-\frac{79\,561.6\,\pi\,\mathcal{A}}{\int_{-\mathcal{A}\,\infty+\gamma}^{\mathcal{A}\,\infty+\gamma} -\frac{49087.9\,e^{-4.15002\times10^{-10}/s+s}\,(-0.0000203716\,i+s)\sqrt{\pi}}{s^{3/2}}\,ds}} \quad \text{for } \gamma > 0$$

## Multiple-argument formulas

$$\sqrt{\frac{4}{3\,(1.64528\,(\cos(-0.0000407432) + i\sin(-0.0000407432)))}} = \sqrt{0.810399}\,\sqrt{\frac{1}{\cos(-0.0000407432) + i\sin(-0.0000407432)}}$$

$$\sqrt{\frac{4}{3\,(1.64528\,(\cos(-0.0000407432) + i\sin(-0.0000407432)))}} = \exp\left(\pi\,\mathcal{A}\left\lfloor -\frac{-\pi + \arg(0.810399) + \arg\left(\frac{1}{\cos(-0.0000407432)+i\sin(-0.0000407432)}\right)}{2\pi}\right\rfloor\right)\sqrt{0.810399}\,\sqrt{\frac{1}{\cos(-0.0000407432) + i\sin(-0.0000407432)}}$$

In conclusion, from the equations above, we obtain these results very close to π and φ, which from Numerical Constants then become Universal Constants:

$$\sqrt[18]{\left(\log\left(-\left(2.37\times 10^{531}\right) i\right) + 521 - 18 + 2 + \frac{2e}{11}\right) + \left(\left(\frac{1}{27}\left(\left(\log\left(-\left(2.37\times 10^{531}\right) i\right) + 521 - 18 + 2 + \frac{2e}{11}\right) - 1\right)\right)^2 - C_{\mathrm{MRB}}\right)} = 1.61876$$

$$\left[\frac{24}{\sqrt{65}} \log\left(\sqrt[4]{2}\left(\sqrt[4]{(1.618762187 + i\times(-0.0001392226091))\left(\frac{1}{2}\left(3+\sqrt{13}\right)\right)} \sqrt{\sqrt{\frac{1}{8}\left(9+\sqrt{65}\right)} + \sqrt{\frac{1}{8}\left(1+\sqrt{65}\right)}}\right)\right)\right] = 3.14193 \approx \pi$$

## On the application of the formulas of the volumes of an octahedron and a sphere

With regard to a sphere inscribed in an octahedron, we have the following formulas.

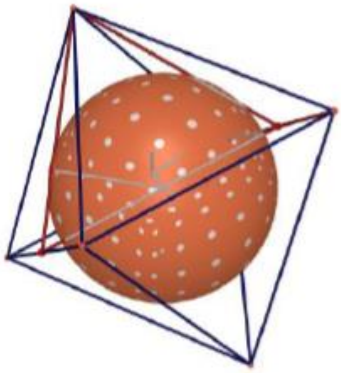


Fig: sphere inscribed in an octahedron

$V_0 = \frac{1}{3}\sqrt{2}\,l^3$

$V_s = \frac{4}{3}\pi r^3$ ; where $r_s = (l/2)$

With regard the ratio between the two above formulas (octahedron and sphere)

(1/3*√2*l^3)/(4/3*π*(l/2)^3)

we obtain:

**Input**

$$\frac{\frac{1}{3}\sqrt{2}\,l^3}{\frac{4}{3}\pi\left(\frac{l}{2}\right)^3}$$

## Result

$\frac{\sqrt{2}\ 2}{\pi}$ (for $l \neq 0$)

## Decimal approximation

0.9003163161571060695551991910067405826645741499552206255714374712

…

0.900316316157106…. = $\frac{2\sqrt{2}}{\pi}$ (DN Constant)

## Property

$\frac{2\sqrt{2}}{\pi}$ is a transcendental number

## Series representations

$$\frac{\sqrt{2}\ l^3}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3} = \frac{2\sqrt{z_0}\ \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (2-z_0)^k z_0^{-k}}{k!}}{\pi} \quad \text{for (not } (z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \leq 0))$$

$$\frac{\sqrt{2}\ l^3}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3} = \frac{2\exp\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}\ \sum_{k=0}^{\infty} \frac{(-1)^k (2-x)^k x^{-k} \left(-\frac{1}{2}\right)_k}{k!}}{\pi}$$

for ($x \in \mathbb{R}$ and $x < 0$)

$$\frac{\sqrt{2}\, l^3}{\frac{1}{3}\left(4\,\pi\left(\frac{l}{2}\right)^3\right)3} =$$

$$\frac{2\left(\frac{1}{z_0}\right)^{1/2\,\lfloor \arg(2-z_0)/(2\pi)\rfloor}\, z_0^{1/2\,(1+\lfloor \arg(2-z_0)/(2\pi)\rfloor)}\, \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k (2-z_0)^k\, z_0^{-k}}{k!}}{\pi}$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

$\mathbb{R}$ is the set of real numbers

$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

$i$ is the imaginary unit

From which:

1/3*(2/((1/3*√2*l^3)/(4/3*π*(l/2)^3)))^2

**Input**

$$\frac{1}{3}\left(\frac{2}{\frac{\frac{1}{3}\sqrt{2}\, l^3}{\frac{4}{3}\,\pi\left(\frac{l}{2}\right)^3}}\right)^2$$

**Result**

$$\frac{\pi^2}{6}$$

**Decimal approximation**

1.6449340668482264364724151666460251892189499012067984377355582293…

1.644934066848226… = ζ(2) = $\pi^2/6$ = 1.644934 (trace of the instanton shape and Ramanujan Recurring Number)

## Property

$\frac{\pi^2}{6}$ is a transcendental number

## Series representations

$$\frac{1}{3}\left(\frac{2}{\frac{\sqrt{2}\ l^3}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}}\right)^2 = \sum_{k=1}^{\infty}\frac{1}{k^2}$$

---

$$\frac{1}{3}\left(\frac{2}{\frac{\sqrt{2}\ l^3}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}}\right)^2 = -2\sum_{k=1}^{\infty}\frac{(-1)^k}{k^2}$$

---

$$\frac{1}{3}\left(\frac{2}{\frac{\sqrt{2}\ l^3}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}}\right)^2 = \frac{4}{3}\sum_{k=0}^{\infty}\frac{1}{(1+2k)^2}$$

## Integral representations

$$\frac{1}{3}\left(\frac{2}{\frac{\sqrt{2}\ l^3}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}}\right)^2 = \frac{8}{3}\left(\int_0^1\sqrt{1-t^2}\ dt\right)^2$$

---

$$\frac{1}{3}\left(\frac{2}{\frac{\sqrt{2}\,l^3}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}}\right)^2 = \frac{2}{3}\left(\int_0^\infty \frac{1}{1+t^2}\,dt\right)^2$$

---

$$\frac{1}{3}\left(\frac{2}{\frac{\sqrt{2}\,l^3}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}}\right)^2 = \frac{2}{3}\left(\int_0^1 \frac{1}{\sqrt{1-t^2}}\,dt\right)^2$$

We note that, from the sum of the first nine numbers excluding 0, i.e., 1+2+3+4+5+6+7+8+9 = 45 (these are the fundamental numbers, from which, through infinite combinations, all the other numbers are obtained), we obtain the following interesting formula:

1+1/(((φ^2+(2Pi)/3*MRB const)(1/e((1+2+3+4+5+6+7+8+9)^(1/Pi))))^1/3)

**Input**

$$1+\frac{1}{\sqrt[3]{\left(\phi^2+\frac{2\pi}{3}C_{\mathrm{MRB}}\right)\left(\frac{1}{e}\sqrt[\pi]{1+2+3+4+5+6+7+8+9}\right)}}$$

$\phi$ is the golden ratio

$C_{\mathrm{MRB}}$ is the MRB constant

**Exact result**

$$3^{-2/(3\pi)}\times 5^{-1/(3\pi)}\sqrt[3]{\frac{e}{\frac{2\pi C_{\mathrm{MRB}}}{3}+\phi^2}}+1$$

## Decimal approximation

1.6452973785207760327718962297937282004549534211102915708253939286

…

1.64529737852…. ≈ ζ(2) = π²/6 = 1.644934 (trace of the instanton shape and Ramanujan Recurring Number)

## Alternate forms

$$3^{1/3-2/(3\pi)} \times 5^{-1/(3\pi)} \sqrt[3]{\frac{e}{2\pi C_{\text{MRB}} + 3\phi^2}} + 1$$

---

$$3^{-2/(3\pi)} \times 5^{-1/(3\pi)} \sqrt[3]{\frac{e}{\frac{2\pi C_{\text{MRB}}}{3} + \frac{1}{2}\left(3+\sqrt{5}\right)}} + 1$$

---

$$2^{2/3} \times 3^{1/3-2/(3\pi)} \times 5^{-1/(3\pi)} \sqrt[3]{\frac{e}{8\pi C_{\text{MRB}} + 18 + 6\sqrt{5}}} + 1$$

## Expanded forms

$$3^{-2/(3\pi)} \times 5^{-1/(3\pi)} \sqrt[3]{\frac{e}{\frac{2\pi C_{\text{MRB}}}{3} + \frac{1}{4}\left(1+\sqrt{5}\right)^2}} + 1$$

---

$$3^{-2/(3\pi)} \times 5^{-1/(3\pi)} \sqrt[3]{\frac{e}{\frac{2\pi C_{\text{MRB}}}{3} + \frac{3}{2} + \frac{\sqrt{5}}{2}}} + 1$$

And:

sqrt(6(1+1/(((φ^2+(2Pi)/3*MRB const)(1/e((1+2+3+4+5+6+7+8+9)^(1/Pi))))^1/3)))

## Input

$$\sqrt{6\left(1+\frac{1}{\sqrt[3]{\left(\phi^2+\frac{2\pi}{3}C_{\text{MRB}}\right)\left(\frac{1}{e}\sqrt[\pi]{1+2+3+4+5+6+7+8+9}\right)}}\right)}$$

$\phi$ is the golden ratio

$C_{\text{MRB}}$ is the MRB constant

## Exact result

$$\sqrt{6\left(3^{-2/(3\pi)}\times5^{-1/(3\pi)}\sqrt[3]{\frac{e}{\frac{2\pi C_{\text{MRB}}}{3}+\phi^2}}+1\right)}$$

## Decimal approximation

3.1419395715265843089243307321961626326775133868116590446825417393

…

3.141939571526…. ≈ π (Ramanujan Recurring Number)

## Alternate forms

$$\sqrt{6\left(3^{1/3-2/(3\pi)}\times5^{-1/(3\pi)}\sqrt[3]{\frac{e}{2\pi C_{\text{MRB}}+3\phi^2}}+1\right)}$$

$$3^{1/2-1/(3\pi)}\times5^{-1/(6\pi)}\sqrt{2\left(\sqrt[3]{\frac{6e}{4\pi C_{\text{MRB}}+9+3\sqrt{5}}}+3^{2/(3\pi)}\sqrt[3\pi]{5}\right)}$$

## Expanded forms

$$\sqrt{6\left(3^{-2/(3\pi)}\times 5^{-1/(3\pi)}\sqrt[3]{\frac{e}{\frac{2\pi C_{\text{MRB}}}{3}+\frac{1}{4}\left(1+\sqrt{5}\right)^2}}+1\right)}$$

---

$$\sqrt{2\times 3^{1-2/(3\pi)}\times 5^{-1/(3\pi)}\sqrt[3]{\frac{e}{\frac{2\pi C_{\text{MRB}}}{3}+\frac{3}{2}+\frac{\sqrt{5}}{2}}}+6}$$

## All 2nd roots of 6 ($3^{-2/(3\pi)}$ $5^{-1/(3\pi)}$ (e/((2 π $C_{\text{MRB}}$)/3+$\phi^2$))$^{1/3}$+1)

$$e^0\sqrt{6\left(3^{-2/(3\pi)}\times 5^{-1/(3\pi)}\sqrt[3]{\frac{e}{\frac{2\pi C_{\text{MRB}}}{3}+\phi^2}}+1\right)}\approx 3.1419 \quad \text{(real, principal root)}$$

---

$$e^{i\pi}\sqrt{6\left(3^{-2/(3\pi)}\times 5^{-1/(3\pi)}\sqrt[3]{\frac{e}{\frac{2\pi C_{\text{MRB}}}{3}+\phi^2}}+1\right)}\approx -3.1419 \quad \text{(real root)}$$

Furthermore, we obtain also:

2π*√2((1/3*√2*l^3)/(4/3*π*(l/2)^3))

## Input

$$2\pi\sqrt{2}\times\frac{\frac{1}{3}\sqrt{2}\,l^3}{\frac{4}{3}\pi\left(\frac{l}{2}\right)^3}$$

## Exact result

8

8

value that is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 8 "modes" corresponding to the physical vibrations of a superstring.

## Series representations

$$\frac{(2\pi\sqrt{2})(\sqrt{2}\,l^3)}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3} = 4\sqrt{z_0}^{\,2}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (2-z_0)^k z_0^{-k}}{k!}\right)^2$$

for (not $(z_0 \in \mathbb{R}$ and $-\infty < z_0 \leq 0))$

---

$$\frac{(2\pi\sqrt{2})(\sqrt{2}\,l^3)}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3} = 4\exp^2\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}^{\,2}\left(\sum_{k=0}^{\infty}\frac{(-1)^k (2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^2$$

for $(x \in \mathbb{R}$ and $x < 0)$

---

$$\frac{(2\pi\sqrt{2})(\sqrt{2}\,l^3)}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3} =$$

$$4\left(\frac{1}{z_0}\right)^{\lfloor\arg(2-z_0)/(2\pi)\rfloor} z_0^{1+\lfloor\arg(2-z_0)/(2\pi)\rfloor}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (2-z_0)^k z_0^{-k}}{k!}\right)^2$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

$\mathbb{R}$ is the set of real numbers

$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

$i$ is the imaginary unit

6π*√2((1/3*√2*1^3)/(4/3*π*(l/2)^3))

## Input

$$6\pi\sqrt{2}\times\frac{\frac{1}{3}\sqrt{2}\,l^3}{\frac{4}{3}\pi\left(\frac{l}{2}\right)^3}$$

## Exact result

24

24

The value 24 is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 24 "modes" corresponding to the physical vibrations of a bosonic string representing a bosons. From the analysis, we observe that the is no number theoretic connection with physical vibrations of fermionic strings at extremally low entropy. This fact is confirmed by the fact that the Higgs bosons at the moment of the big bang and infinitesimally shortly thereafter, facilitated the creation of fermions (matter and antimatter particles) [8]. Thus we note that the ingredients for the formation of electromagnetic radiation from photons (a Boson), and the formation of matter from the Higgs boson after the big bang, are intrinsic properties of the vacuum energy in pre-big bang.

## Series representations

$$\frac{\left(6\pi\sqrt{2}\right)\left(\sqrt{2}\,l^3\right)}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3} = 12\sqrt{z_0}^{\,2}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k (2-z_0)^k z_0^{-k}}{k!}\right)^2$$

for (not ($z_0 \in \mathbb{R}$ and $-\infty < z_0 \leq 0$))

$$\frac{\left(6\pi\sqrt{2}\right)\left(\sqrt{2}\ l^3\right)}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3} = 12\exp^2\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}^{\,2}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\,(2-x)^k\,x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^2$$

for $(x \in \mathbb{R}$ and $x < 0)$

---

$$\frac{\left(6\pi\sqrt{2}\right)\left(\sqrt{2}\ l^3\right)}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3} =$$

$$12\left(\frac{1}{z_0}\right)^{\lfloor\arg(2-z_0)/(2\pi)\rfloor} z_0^{1+\lfloor\arg(2-z_0)/(2\pi)\rfloor}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k\,z_0^{-k}}{k!}\right)^2$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

$\mathbb{R}$ is the set of real numbers

$\arg(z)$ is the complex argument

$\lfloor x\rfloor$ is the floor function

$i$ is the imaginary unit

This could imply that all matter (fermions) was preceded by bosons. That is, before the Big Bang, from perturbations of the vacuum energy itself, bosons were created, and successively at the Big Bang, and infinitesimally shortly after the Big Bang, fermions, were created from the vacuum energy that underwent a violent “breaking” that formed a hot plasma. of particle-antiparticle pairs. This therefore implies that quantum gravity was not necessarily “dark” to some extent, because a photon (light particle) is itself a boson. Therefore, a big bang was not necessarily the moment of the creation of light, but of the creation of matter (fermions) from vacuum energy, as this undergoes further "breaking" in the cosmological constant, in the hot plasma of matter and in the energy dark.

(2π*√2((1/3*√2*l^3)/(4/3*π*(l/2)^3)))^4

**Input**

$$\left(2\,\pi\,\sqrt{2}\times\frac{\frac{1}{3}\sqrt{2}\,l^3}{\frac{4}{3}\,\pi\left(\frac{l}{2}\right)^3}\right)^4$$

**Exact result**

4096

4096 = $64^2$ , (Ramanujan Recurring Number) that multiplied by 2 give 8192, indeed:

The total amplitude vanishes for gauge group SO(8192), while the vacuum energy is negative and independent of the gauge group. The vacuum energy and dilaton tadpole to lowest non-trivial order for the open bosonic string. While the vacuum energy is non-zero and independent of the gauge group, the dilaton tadpole is zero for a unique choice of gauge group, SO($2^{13}$) i.e. SO(8192). (From: "Dilaton Tadpole for the Open Bosonic String " Michael R. Douglas and Benjamin Grinstein - September 2,1986)

27*sqrt((2π*√2((1/3*√2*l^3)/(4/3*π*(l/2)^3)))^4)+1

**Input**

$$27\sqrt{\left(2\,\pi\,\sqrt{2}\times\frac{\frac{1}{3}\sqrt{2}\,l^3}{\frac{4}{3}\,\pi\left(\frac{l}{2}\right)^3}\right)^4}+1$$

**Exact result**

1729

1729

This result is very near to the mass of candidate glueball $f_0$(1710) scalar meson. Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve (1728 = $8^2$ * $3^3$). The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number, as it can be expressed as the sum of two cubes in two different ways ($10^3 + 9^3 = 12^3 + 1^3 = 1729$) and Ramanujan's recurring number)

## Series representations

$$27\sqrt{\left(\frac{\left(2\pi\sqrt{2}\right)\left(\sqrt{2}\,l^3\right)}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3}\right)^4} + 1 =$$
$$1 + 27\sqrt{-1 + 256\sqrt{2}^8}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(-1 + 256\sqrt{2}^8\right)^{-k}$$

---

$$27\sqrt{\left(\frac{\left(2\pi\sqrt{2}\right)\left(\sqrt{2}\,l^3\right)}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3}\right)^4} + 1 =$$
$$1 + 27\sqrt{-1 + 256\sqrt{2}^8}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(-1 + 256\sqrt{2}^8\right)^{-k}}{k!}$$

---

$$27\sqrt{\left(\frac{\left(2\pi\sqrt{2}\right)\left(\sqrt{2}\,l^3\right)}{\frac{1}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)3}\right)^4} + 1 = 1 + 27\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(256\sqrt{2}^8 - z_0\right)^k z_0^{-k}}{k!}$$

for (not ($z_0 \in \mathbb{R}$ and $-\infty < z_0 \le 0$))

$\binom{n}{m}$ is the binomial coefficient

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

$\mathbb{R}$ is the set of real numbers

We note that:

1/25*1/144(((2π*√2((1/3*√2*l^3)/(4/3*π*(l/2)^3)))^4)+(27*sqrt((2π*√2((1/3*√2*l^3)/(4/3*π*(l/2)^3)))^4)+1))

**Input**

$$\frac{1}{25}\times\frac{1}{144}\left(\left(2\pi\sqrt{2}\times\frac{\frac{1}{3}\sqrt{2}\,l^3}{\frac{4}{3}\pi\left(\frac{l}{2}\right)^3}\right)^4+\left(27\sqrt{\left(2\pi\sqrt{2}\times\frac{\frac{1}{3}\sqrt{2}\,l^3}{\frac{4}{3}\pi\left(\frac{l}{2}\right)^3}\right)^4+1}\right)\right)$$

**Exact result**

$$\frac{233}{144}$$

**Decimal approximation**

1.6180555555555555555555555555555555555555555555555555555555555

…

1.61805555…. result that is a very good approximation to the value of the golden ratio 1.618033988749… (Ramanujan Recurring Number)

**Repeating decimal**

$1.6180\overline{5}$ (period 1)

## Series representations

$$\frac{\left(\frac{2\left(\sqrt{2}\ l^3\right)\pi\sqrt{2}}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}\right)^4+\left(27\sqrt{\left(\frac{2\left(\sqrt{2}\ l^3\right)\pi\sqrt{2}}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}\right)^4}+1\right)}{144\times 25}=$$

$$\frac{1}{3600}\left(1+256\sqrt{z_0}^{\,8}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k\,z_0^{-k}}{k!}\right)^8+\right.$$
$$\left.27\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(256\sqrt{2}^{\,8}-z_0\right)^k z_0^{-k}}{k!}\right)$$

for (not ($z_0 \in \mathbb{R}$ and $-\infty < z_0 \leq 0$))

---

$$\frac{\left(\frac{2\left(\sqrt{2}\ l^3\right)\pi\sqrt{2}}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}\right)^4+\left(27\sqrt{\left(\frac{2\left(\sqrt{2}\ l^3\right)\pi\sqrt{2}}{\frac{3}{3}\left(4\pi\left(\frac{l}{2}\right)^3\right)}\right)^4}+1\right)}{144\times 25}=$$

$$\frac{1}{3600}\left(1+256\exp^8\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}^{\,8}\left(\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^8+\right.$$
$$27\exp\left(i\pi\left\lfloor\frac{\arg\left(-x+256\sqrt{2}^{\,8}\right)}{2\pi}\right\rfloor\right)\sqrt{x}$$
$$\left.\sum_{k=0}^{\infty}\frac{(-1)^k x^{-k}\left(-\frac{1}{2}\right)_k\left(-x+256\sqrt{2}^{\,8}\right)^k}{k!}\right)$$

for ($x \in \mathbb{R}$ and $x < 0$)

---

$$\frac{\left(\frac{2\left(\sqrt{2}\ i^3\right)\pi\sqrt{2}}{\frac{3}{3}\left(4\pi\left(\frac{i}{2}\right)^3\right)}\right)^4+\left(27\sqrt{\left(\frac{2\left(\sqrt{2}\ i^3\right)\pi\sqrt{2}}{\frac{3}{3}\left(4\pi\left(\frac{i}{2}\right)^3\right)}\right)^4}+1\right)}{144\times 25}=\frac{1}{3600}$$

$$\left(1+256\left(\frac{1}{z_0}\right)^{4\lfloor\arg(2-z_0)/(2\pi)\rfloor} z_0^{4+4\lfloor\arg(2-z_0)/(2\pi)\rfloor}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k\,z_0^{-k}}{k!}\right)^8+\right.$$

$$27\left(\frac{1}{z_0}\right)^{1/2\left\lfloor\arg\left(256\sqrt{2}^{\,8}-z_0\right)/(2\pi)\right\rfloor} z_0^{1/2+1/2\left\lfloor\arg\left(256\sqrt{2}^{\,8}-z_0\right)/(2\pi)\right\rfloor}$$

$$\left.\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(256\sqrt{2}^{\,8}-z_0\right)^k z_0^{-k}}{k!}\right)$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

$\mathbb{R}$ is the set of real numbers

$\arg(z)$ is the complex argument

$\lfloor x\rfloor$ is the floor function

$i$ is the imaginary unit

From

$\frac{2\sqrt{2}}{\pi}$ is a transcendental number

we obtain also:

sqrt(6(1/3*(2/(((2sqrt2)/Pi)))^2))

**Input**

$$\sqrt{6\left(\frac{1}{3}\left(\frac{2}{\frac{2\sqrt{2}}{\pi}}\right)^2\right)}$$

## Exact result

$\pi$

## Decimal approximation

3.1415926535897932384626433832795028841971693993751058209749445923…

3.14159265358… = π

## Property

$\pi$ is a transcendental number

## All 2nd roots of $\pi^2$

$\pi e^0 \approx 3.1416$ (real, principal root)

---

$\pi e^{i\pi} \approx -3.1416$ (real root)

## Series representations

$$\sqrt{\frac{6}{3}\left(\frac{2}{\frac{2\sqrt{2}}{\pi}}\right)^2} = 4\sum_{k=0}^{\infty}\frac{(-1)^k}{1+2k}$$

---

$$\sqrt{\frac{6}{3}\left(\frac{2}{\frac{2\sqrt{2}}{\pi}}\right)^2} = \sum_{k=0}^{\infty}-\frac{4(-1)^k\, 1195^{-1-2k}\left(5^{1+2k}-4\times 239^{1+2k}\right)}{1+2k}$$

---

$$\sqrt{\frac{6}{3}\left(\frac{2}{\frac{2\sqrt{2}}{\pi}}\right)^2} = \sum_{k=0}^{\infty}\left(-\frac{1}{4}\right)^k\left(\frac{1}{1+2k}+\frac{2}{1+4k}+\frac{1}{3+4k}\right)$$

**Integral representations**

$$\sqrt{\frac{6}{3}\left(\frac{2}{\frac{2\sqrt{2}}{\pi}}\right)^2} = 4\int_0^1 \sqrt{1-t^2}\,dt$$

---

$$\sqrt{\frac{6}{3}\left(\frac{2}{\frac{2\sqrt{2}}{\pi}}\right)^2} = 2\int_0^1 \frac{1}{\sqrt{1-t^2}}\,dt$$

---

$$\sqrt{\frac{6}{3}\left(\frac{2}{\frac{2\sqrt{2}}{\pi}}\right)^2} = 2\int_0^{\infty} \frac{1}{1+t^2}\,dt$$

It is plausible to hypothesize that π and φ, in addition to being important mathematical constants, are constants that also have a fundamental relevance in the various sectors of Theoretical Physics and Cosmology

From $\frac{\pi^2}{6}$, we obtain:

sqrt(1/(Pi^2/6)*(4/3))

**Input**

$$\sqrt{\frac{1}{\frac{\pi^2}{6}} \times \frac{4}{3}}$$

## Exact result

$$\frac{2\sqrt{2}}{\pi}$$

## Decimal approximation

0.9003163161571060695551991910067405826645741499552206255714374712…

0.900316316157106…. = $\frac{2\sqrt{2}}{\pi}$ (DN Constant)

## Property

$\frac{2\sqrt{2}}{\pi}$ is a transcendental number

## All 2nd roots of $8/\pi^2$

$\frac{2\sqrt{2}\, e^0}{\pi} \approx 0.9003$ (real, principal root)

---

$\frac{2\sqrt{2}\, e^{i\pi}}{\pi} \approx -0.9003$ (real root)

## Series representations

$$\sqrt{\frac{4}{\frac{3\pi^2}{6}}} = \sum_{k=0}^{\infty} \frac{(-1)^k \left(-1+\frac{8}{\pi^2}\right)^k \left(-\frac{1}{2}\right)_k}{k!}$$

$$\sqrt{\frac{4}{\frac{3\pi^2}{6}}} = \sqrt{z_0} \sum_{k=0}^{\infty} \frac{(-1)^k \left(-\frac{1}{2}\right)_k \left(\frac{8}{\pi^2}-z_0\right)^k z_0^{-k}}{k!} \quad \text{for (not } (z_0 \in \mathbb{R} \text{ and } -\infty < z_0 \le 0))$$

$$\sqrt{\frac{4}{\frac{3\pi^2}{6}}} = \exp\left(i\pi \left\lfloor \frac{\arg\left(\frac{8}{\pi^2}-x\right)}{2\pi} \right\rfloor\right) \sqrt{x} \sum_{k=0}^{\infty} \frac{(-1)^k \left(\frac{8}{\pi^2}-x\right)^k x^{-k} \left(-\frac{1}{2}\right)_k}{k!}$$

for ($x \in \mathbb{R}$ and $x < 0$)

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

$\mathbb{R}$ is the set of real numbers

$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

$i$ is the imaginary unit

## DN Constant extended

We have the following expression concerning the ratios (and/or the inverses) between the icosahedron, octahedron and tetrahedron volumes and the sphere volume.

$$\sqrt[2\pi]{\frac{\frac{5}{12}(3+\sqrt{5})d^3}{\frac{4}{3}\pi\left(\frac{d}{2}\right)^3} \times \frac{1}{\frac{\frac{1}{3}\sqrt{2}a^3}{\frac{4}{3}\pi\left(\frac{a}{2}\right)^3}} \times \frac{1}{\frac{\sqrt{2}}{12}d^3 \cdot \frac{1}{\frac{4}{3}\pi\left(\frac{d}{2}\right)^3}}}$$

(we have highlighted the DN Constant in blue)

(((((5/12*(3+√5)*d^3)/(4/3*π*(d/2)^3))*1/((1/3*√2*a^3)/(4/3*π*(a/2)^3)) *1/((((√2 d^3)/12))*1/(4/3*π*(d/2)^3)))))^(1/(2π))

**Input**

$$\sqrt[2\pi]{\frac{\frac{5}{12}\left(3+\sqrt{5}\right)d^3}{\frac{4}{3}\pi\left(\frac{d}{2}\right)^3} \times \frac{1}{\frac{\frac{1}{3}\sqrt{2}\,a^3}{\frac{4}{3}\pi\left(\frac{a}{2}\right)^3}} \times \frac{1}{\left(\frac{1}{12}\left(\sqrt{2}\,d^3\right)\right) \times \frac{1}{\frac{4}{3}\pi\left(\frac{d}{2}\right)^3}}}$$

**Exact result**

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}$$

## Decimal approximation

1.6180085459001070581002623979536005212943435960226956084921288971

…

1.6180085459…. result that is a very good approximation to the value of the golden ratio 1.618033988749… (Ramanujan Recurring Number)

## Alternate form

$$2^{-1/\pi}\sqrt[2\pi]{\left(15+5\sqrt{5}\right)\pi}$$

## Series representations

$$\sqrt[2\pi]{\frac{5\left(3+\sqrt{5}\right)d^3}{\frac{\left(\left(\sqrt{2}\,a^3\right)\left(\sqrt{2}\,d^3\right)\right)12\left(4\pi\left(\frac{d}{2}\right)^3\right)}{\frac{\left(\left(3\left(4\pi\left(\frac{a}{2}\right)^3\right)\right)\left(12\left(4\pi\left(\frac{d}{2}\right)^3\right)\right)\right)3}{3\times 3}}}} = \sqrt[2\pi]{\frac{5}{2}}\sqrt[2\pi]{\frac{\pi\left(3+\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}\right)}{\sqrt{z_0}^{\,2}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}\right)^2}}$$

for (not ($z_0 \in \mathbb{R}$ and $-\infty < z_0 \leq 0$))

$$\sqrt[2\pi]{\frac{5\left(3+\sqrt{5}\right)d^3}{\frac{\left(\left(\sqrt{2}\,a^3\right)\left(\sqrt{2}\,d^3\right)\right)12\left(4\pi\left(\frac{d}{2}\right)^3\right)}{\frac{\left(\left(3\left(4\pi\left(\frac{a}{2}\right)^3\right)\right)\left(12\left(4\pi\left(\frac{d}{2}\right)^3\right)\right)\right)3}{3\times 3}}}} = \sqrt[2\pi]{\frac{5}{2}}\sqrt[2\pi]{\frac{\pi\left(3+\exp\left(i\pi\left\lfloor\frac{\arg(5-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(5-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)}{\exp^2\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}^{\,2}\left(\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^2}}$$

for ($x \in \mathbb{R}$ and $x < 0$)

$$\sqrt[2\pi]{\frac{5\left(3+\sqrt{5}\right)d^3}{\frac{\left(\left(\sqrt{2}\,a^3\right)\left(\sqrt{2}\,d^3\right)\right)12\left(4\pi\left(\frac{d}{2}\right)^3\right)}{\frac{\left(\left(3\left(4\pi\left(\frac{a}{2}\right)^3\right)\right)\left(12\left(4\pi\left(\frac{d}{2}\right)^3\right)\right)\right)3}{3\times 3}}}} =$$

$$\sqrt[2\pi]{\frac{5}{2}}\ \Bigg(\Bigg(\pi\left(\frac{1}{z_0}\right)^{-\lfloor\arg(2-z_0)/(2\pi)\rfloor} z_0^{-1-\lfloor\arg(2-z_0)/(2\pi)\rfloor}\Bigg(3+\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}$$

$$z_0^{1/2+1/2\lfloor\arg(5-z_0)/(2\pi)\rfloor}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k\,z_0^{-k}}{k!}\Bigg)\Bigg)\Bigg/$$

$$\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k\,z_0^{-k}}{k!}\right)^2\Bigg)^\wedge\left(\frac{1}{2\pi}\right)$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

$\mathbb{R}$ is the set of real numbers

$\arg(z)$ is the complex argument

$\lfloor x\rfloor$ is the floor function

$i$ is the imaginary unit

## Integral representation

$$(1+z)^a = \frac{\int_{-i\,\infty+\gamma}^{i\,\infty+\gamma}\frac{\Gamma(s)\,\Gamma(-a-s)}{z^s}\,ds}{(2\pi i)\,\Gamma(-a)} \quad \text{for } (0<\gamma<-\operatorname{Re}(a) \text{ and } |\arg(z)|<\pi)$$

$\Gamma(x)$ is the gamma function

$\operatorname{Re}(z)$ is the real part of $z$

$|z|$ is the absolute value of $z$

Furthermore, from the formula

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}$$

we obtain also:

(4 (1.6180085459)^(2 π))/(5 (3 + sqrt(5))) = 3.1415926535

Indeed:

$$\frac{4\times 1.6180085459^{2\pi}}{5\left(3+\sqrt{5}\right)}$$

3.1415926535884871624221932509858715278931025189245576170078100613

...

3.1415926535…. = π (Ramanujan Recurring Number)

From the following extended DN Constant ("Unitary Formula")

$$\sqrt[2\pi]{\frac{\frac{5}{12}\left(3+\sqrt{5}\right)d^3}{\frac{4}{3}\pi\left(\frac{d}{2}\right)^3}\times\frac{1}{\frac{\frac{1}{3}\sqrt{2}a^3}{\frac{4}{3}\pi\left(\frac{a}{2}\right)^3}}\times\frac{1}{\frac{\sqrt{2}}{12}d^3\cdot\frac{1}{\frac{4}{3}\pi\left(\frac{d}{2}\right)^3}}}\times\sqrt[3]{-\frac{q}{2}+\sqrt{\frac{q^2}{4}+\frac{p^3}{27}}}+\sqrt[3]{-\frac{q}{2}-\sqrt{\frac{q^2}{4}+\frac{p^3}{27}}}$$

with regard

$$\sqrt[3]{-\frac{q}{2}+\sqrt{\frac{q^2}{4}+\frac{p^3}{27}}}+\sqrt[3]{-\frac{q}{2}-\sqrt{\frac{q^2}{4}+\frac{p^3}{27}}}$$

for q = 1729 and p = 4096, we obtain by changing the sign in the algebraic sum of the aforementioned Cardano's Formula and after some calculations:

$$2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}$$

multiplied by

$$\sqrt[9]{\sqrt[3]{-\frac{1729}{2}+\sqrt{\frac{1729^2}{4}+\frac{4096^3}{27}}}-\sqrt[3]{-\frac{1729}{2}-\sqrt{\frac{1729^2}{4}+\frac{4096^3}{27}}}}$$

and performing the ninth root of the entire expression:

√((2^(-1/π)(5(3+√(5))π)^(1/(2π)))((∛(-1729/2+√(1729^2/4+4096^3/27)) -∛(-1729/2-√(1729^2/4+4096^3/27)))^1/9))

we obtain:

$$\sqrt{\left(\left(2^{-1/\pi}\sqrt[2\pi]{5\left(3+\sqrt{5}\right)\pi}\right)\sqrt[9]{\sqrt[3]{-\frac{1729}{2}+\sqrt{\frac{1729^2}{4}+\frac{4096^3}{27}}}-\sqrt[3]{-\frac{1729}{2}-\sqrt{\frac{1729^2}{4}+\frac{4096^3}{27}}}}\right)}$$

$$2^{-1/(2\pi)}\sqrt[18]{\sqrt[3]{\frac{\sqrt{\frac{274958621851}{3}}}{6}-\frac{1729}{2}}+\sqrt[3]{\frac{1729}{2}+\frac{\sqrt{\frac{274958621851}{3}}}{6}}}\;\sqrt[4\pi]{5\left(3+\sqrt{5}\right)\pi}$$

i.e.

2^(-1/(2π)) ((-1729/2+√(274958621851/3)/6)^(1/3)+(1729/2 + √(274958621851/3)/6)^(1/3))^(1/18) (5(3+√(5)) π)^(1/(4π))

= 1.61549140391….

The general "unitary" formula, which derives from DN Constant, is the following:

$$\sqrt{2\times\frac{2\cdot\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{\pi\cdot 0.9991104684}\left(C\times \mathrm{R}\times 2.33\cdot 10^{-13}\right)}}\cong 1.61803398\ldots=\frac{\sqrt{5}+1}{2}$$

Where $\frac{2\sqrt{2}}{\pi}$ is the Del Gaudio-Nardelli Constant, 0.9991104684 is the value of the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{\pi}{\sqrt{5}}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\varphi^5\sqrt[4]{5^3}}-1}}-\varphi+1}=1-\frac{e^{-\pi\sqrt{5}}}{1+\frac{e^{-2\pi\sqrt{5}}}{1+\frac{e^{-3\pi\sqrt{5}}}{1+\frac{e^{-4\pi\sqrt{5}}}{1+\ldots}}}}\approx 0.9991104684$$

C is any constant or solution to an equation, R is the radius of the Universe and $2.33*10^{-13}$ is the temperature of the universe expressed in GeV.

For example, $C$ = 9.9128 , inserting a radius of the Universe, which we have calculated, equal to R = $2.06274*10^{12}$ years, from DN Constant "unitary" formula, we obtain:

√(2×(2·(((2√2)/π))^(1/16))/(1/(π·0.9991104684) (9.9128×(2.06274 × 10^12)×2.33·10^(-13))))

$$\sqrt{2\times\frac{2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{\pi\times 0.9991104684}\times\frac{9.9128\times 2.06274\times 10^{12}\times 2.33}{10^{13}}}}$$

1.618035912348264235440174408834709854254527350840173356306481810 7

…

1.618035912348…. result that is a very good approximation to the value of the golden ratio 1.618033988749… (Ramanujan Recurring Number)

We obtain also:

(√(2×(2·(((2√2)/π))^(1/16))/(1/(π·0.9991104684) (9.9128×(2.06274 × 10^12)×2.33·10^(-13)))))dxdydz

**Indefinite integral assuming all variables are real**

$0.809018\, x^2\, y\, z + \text{constant}$

**Definite integral over a cube of edge length 2 L**

$$\int_{-L}^{L}\int_{-L}^{L}\int_{-L}^{L} 1.61804\, dx\, dy\, dz = 12.9443\, L^3$$

**Definite integral over a sphere of radius R**

$$\iiint_{x^2+y^2+z^2<R^2} 1.61804\, dz\, dy\, dx = 6.77761\, R^3$$

From which, for L = R = 1 , dividing the two definite integral results by the original expression, we obtain:

12.9443/(√(2×(2·(((2√2)/π))^(1/16))/(1/(π·0.9991104684) (9.9128×(2.06274 × 10^12)×2.33·10^(-13)))))

**Input interpretation**

$$\frac{12.9443}{\sqrt{2\times\frac{2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{\pi\times0.9991104684}\times\frac{9.9128\times2.06274\times10^{12}\times2.33}{10^{13}}}}}$$

**Result**

8.00001…

8.00001…. ≈ 8

value that is linked to the "Ramanujan function" (an elliptic modular function that satisfies the need for "conformal symmetry") that has 8 "modes" corresponding to the physical vibrations of a superstring.

And

3*(6.77761/(√(2×(2·(((2√2)/π))^(1/16))/(1/(π·0.9991104684) (9.9128×(2.06274 × 10^12)×2.33·10^(-13))))))

**Input interpretation**

$$3\times\frac{6.77761}{\sqrt{2\times\frac{2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{1}{\pi\times0.9991104684}\times\frac{9.9128\times2.06274\times10^{12}\times2.33}{10^{13}}}}}$$

**Result**

12.5664…

12.5664…. ≈ 4π = Bekenstein-Hawking ($S_{BH}$) black hole entropy

## New fundamental formula deriving from DN Constant

The DN Constant (Del Gaudio-Nardelli Constant) equals (2√2)/π) is defined as the ratio of the volume of an octahedron to the volume of a sphere and is an intriguing mathematical concept. Michele Nardelli hypothesized that the regular octahedron represents a phase in which the universe is highly symmetrical and with very low entropy. On the other hand, the sphere (which is inscribed in the octahedron, i.e. is "inside" it) represents the universe emerging from the quantum vacuum, which over time increases entropy and undergoes various symmetry breakings. This occurs in a regime of eternal inflation.

From the following expression

√(2×(2·(((2√2)/π)^(1/16)))/(4096/(π·0.9991104684) (((1.616255*10^-35)/(1.1056*10^-52))×C×R)))

$$\sqrt{2\times\frac{2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{4096}{\pi\times 0.9991104684}\left(\frac{1.616255\times 10^{-35}}{1.1056\times 10^{-52}}\,C\,R\right)}}$$

which comes from the DN Constant, with $1.616255*10^{-35}$ which is equal to the Planck length, $1.1056*10^{-52}$ which is equal to the Cosmological Constant, C = 1729 which corresponds to the Hardy-Ramanujan number and R = $4.6018401361 \times 10^{-24}$, which represents the radius of the Universe, we obtain:

√(2×(2·(((2√2)/π)^(1/16)))/(4096/(π·0.9991104684) (((1.616255*10^-35)/(1.1056*10^-52))×1729×4.6018401361 × 10^-24))) = 1.6180329973...

$$\sqrt{2\times\frac{2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{4096}{\pi\times0.9991104684}\left(\frac{1.616255\times10^{-35}}{1.1056\times10^{-52}}\times1729\times4.6018401361\times10^{-24}\right)}}$$

1.6180329973075324915067570166297467464225772608929671407919395903…

1.6180329973075… result that is a very good approximation to the value of the golden ratio 1.618033988749… (Ramanujan Recurring Number)

We have also the following formula:

√(2×(2·(((2√2)/π)^(1/16)))/(4096/(π·0.9991104684) (((1.616255*10^-35)/(1.1056*10^-52))×1729×(4.4525642121 × 10^-24))))

**Input interpretation**

$$\sqrt{2\times\frac{2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{4096}{\pi\times0.9991104684}\left(\frac{1.616255\times10^{-35}}{1.1056\times10^{-52}}\times1729\times4.4525642121\times10^{-24}\right)}}$$

**Result**

1.6449323521020921304838989837041511688766218416551668779141660338…

1.64493235210209213…≈ $\zeta(2) = \pi^2/6 = 1.644934$ (trace of the instanton shape and Ramanujan Recurring Number)

And again:

√(2×(2·(((2√2)/π)^(1/16)))/(4096/(π·0.9991104684) (((1.616255*10^-35)/(1.1056*10^-52))×1729×(1.2206935225 × 10^-24))))

## Input interpretation

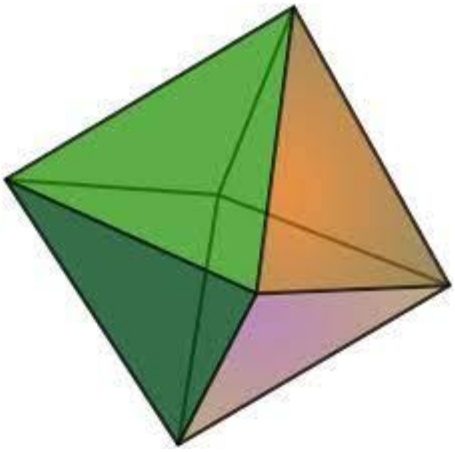
$$\sqrt{2\times\frac{2\sqrt[16]{\frac{2\sqrt{2}}{\pi}}}{\frac{4096}{\pi\times 0.9991104684}\left(\frac{1.616255\times 10^{-35}}{1.1056\times 10^{-52}}\times 1729\times 1.2206935225\times 10^{-24}\right)}}$$

## Result

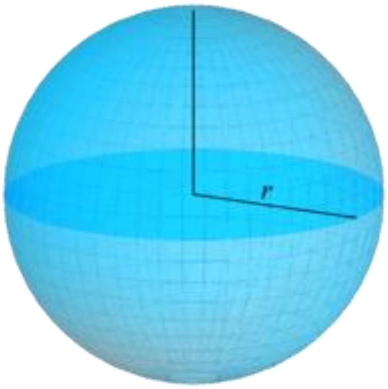
3.1415922573146993939950039231605796469731171781644423955790024797 …

3.14159225731469…≈ π (Ramanujan Recurring Number)

Now, we have that:



Octahedron



Sphere

Given the value of a volume, independently of the solid, following the Poincaré Conjecture, we compare any solid "without holes" and a sphere. If we compare an octahedron with a sphere, we have:

$$\frac{4}{3}\pi r^3 = \frac{1}{3}\sqrt{2}a^3$$

If we consider the radius of the sphere as an unknown, we must find the value of the side of the octahedron which allows us to equalize the two volumes and which will give us the DN Constant as a result (which will therefore be equal to the radius of the sphere).

From

$$\frac{4}{3}\pi r^3 = \frac{1}{3}\sqrt{2}a^3$$

To find $r$ we perform the following calculation:

$$r^3 = \frac{\frac{1}{3}\sqrt{2}a^3}{\frac{4}{3}\pi} = \frac{1}{3}\sqrt{2}a^3 \cdot \frac{3}{4\pi} = \frac{\sqrt{2}a^3}{4\pi} = \frac{\sqrt{2}\cdot\sqrt{2}a^3}{\sqrt{2}\cdot 4\pi} = \frac{2a^3}{\sqrt{2}\cdot 4\pi} = \frac{a^3}{2\sqrt{2}\pi}$$

$$r^3 = \frac{a^3}{2\sqrt{2}\pi}; \qquad r = \sqrt[3]{\frac{a^3}{2\sqrt{2}\pi}} = \frac{a}{\sqrt[3]{2\sqrt{2}\pi}}$$

To find $a$, we have, for

$$r = \frac{2\sqrt{2}}{\pi}; \qquad \frac{a}{\sqrt[3]{2\sqrt{2}\pi}} = \frac{2\sqrt{2}}{\pi};$$

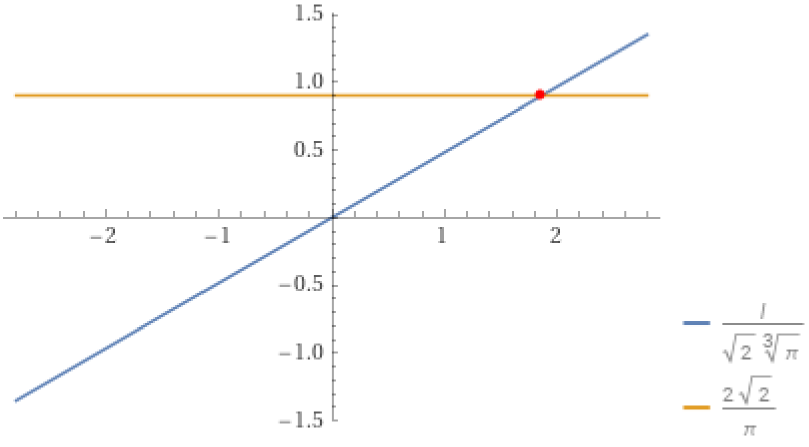
Thus, multiplying both the sides by $\sqrt[3]{2\sqrt{2}\pi}$ , we obtain:

$$a = \frac{2\sqrt{2}}{\pi}\cdot\sqrt[3]{2\sqrt{2}\pi} = \sqrt[3]{\frac{\left(2\sqrt{2}\right)^3 2\sqrt{2}\pi}{\pi^3}} =$$

$$= \sqrt[3]{\frac{8\cdot\sqrt{2^3}\cdot 2\sqrt{2}}{\pi^2}} = \sqrt[3]{\frac{8\cdot\sqrt{2\cdot 2^2}\cdot 2\sqrt{2}}{\pi^2}} = \sqrt[3]{\frac{16\cdot\sqrt{2}\cdot 2\sqrt{2}}{\pi^2}}$$

$$= \sqrt[3]{\frac{32\sqrt{2}\sqrt{2}}{\pi^2}} = \sqrt[3]{\frac{32\cdot 2}{\pi^2}} = \frac{\sqrt[3]{64}}{\sqrt[3]{\pi^2}} = \frac{4}{\sqrt[3]{\pi^2}}; \; a = \frac{4}{\sqrt[3]{\pi^2}}$$

## Plot



## Solution

$$a = \frac{4}{\sqrt[3]{\pi^2}}$$

for V = 1/3*√2*a^3 (octahedron volume) and V = (4/3*π*r^3) (sphere volume), we obtain:

from the octahedron volume, we have: V = 1/3*√2*a$^3$ = (1/3*√2*($\frac{4}{\sqrt[3]{\pi^2}}$)^3)

(1/3*√2*(4/∛(π^2 ))^3)

## Input

$$\frac{1}{3}\sqrt{2}\left(\frac{4}{\sqrt[3]{\pi^2}}\right)^3$$

$\sqrt[3]{x}$ is the real-valued 3rd root of $x$

## Exact result

$$\frac{64\sqrt{2}}{3\pi^2}$$

## Decimal approximation

3.0568488973373667352847687441746434728806619910203860253430294137

…

3.05684889733….

## Property

$\frac{64\sqrt{2}}{3\pi^2}$ is a transcendental number

## Series representations

$$\frac{1}{3}\sqrt{2}\left(\frac{4}{\sqrt[3]{\pi^2}}\right)^3 = \frac{64\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}{3\pi^2}$$

for (not ($z_0 \in \mathbb{R}$ and $-\infty < z_0 \le 0$))

---

$$\frac{1}{3}\sqrt{2}\left(\frac{4}{\sqrt[3]{\pi^2}}\right)^3 = \frac{64\exp\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}}{3\pi^2}$$

for ($x \in \mathbb{R}$ and $x < 0$)

---

$$\frac{1}{3}\sqrt{2}\left(\frac{4}{\sqrt[3]{\pi^2}}\right)^3 =$$

$$\frac{64\left(\frac{1}{z_0}\right)^{1/2\lfloor\arg(2-z_0)/(2\pi)\rfloor} z_0^{1/2(1+\lfloor\arg(2-z_0)/(2\pi)\rfloor)} \sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}}{3\pi^2}$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

$\mathbb{R}$ is the set of real numbers

$\arg(z)$ is the complex argument

$\lfloor x\rfloor$ is the floor function

$i$ is the imaginary unit

And, from the sphere volume V = (4/3*π*r$^3$) = (4/3*π*((2√2)/π)^3)

(4/3*π*((2√2)/π)^3)

**Input**

$$\frac{4}{3}\pi\left(\frac{2\sqrt{2}}{\pi}\right)^3$$

**Result**

$$\frac{64\sqrt{2}}{3\pi^2}$$

**Decimal approximation**

3.0568488973373667352847687441746434728806619910203860253430294137…

3.05684889733….

## Property

$\frac{64\sqrt{2}}{3\pi^2}$ is a transcendental number

## Series representations

$$\frac{1}{3}\left(\pi\left(\frac{2\sqrt{2}}{\pi}\right)^3\right)4 = \frac{32\sqrt{z_0}^3\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}\right)^3}{3\pi^2}$$

for (not ($z_0 \in \mathbb{R}$ and $-\infty < z_0 \leq 0$))

---

$$\frac{1}{3}\left(\pi\left(\frac{2\sqrt{2}}{\pi}\right)^3\right)4 = \frac{32\exp^3\left(i\pi\left\lfloor\frac{\arg(2-x)}{2\pi}\right\rfloor\right)\sqrt{x}^3\left(\sum_{k=0}^{\infty}\frac{(-1)^k(2-x)^k x^{-k}\left(-\frac{1}{2}\right)_k}{k!}\right)^3}{3\pi^2}$$

for ($x \in \mathbb{R}$ and $x < 0$)

---

$$\frac{1}{3}\left(\pi\left(\frac{2\sqrt{2}}{\pi}\right)^3\right)4 = \frac{32\left(\frac{1}{z_0}\right)^{3/2\lfloor\arg(2-z_0)/(2\pi)\rfloor} z_0^{3/2(1+\lfloor\arg(2-z_0)/(2\pi)\rfloor)}\left(\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(2-z_0)^k z_0^{-k}}{k!}\right)^3}{3\pi^2}$$

$n!$ is the factorial function

$(a)_n$ is the Pochhammer symbol (rising factorial)

$\mathbb{R}$ is the set of real numbers

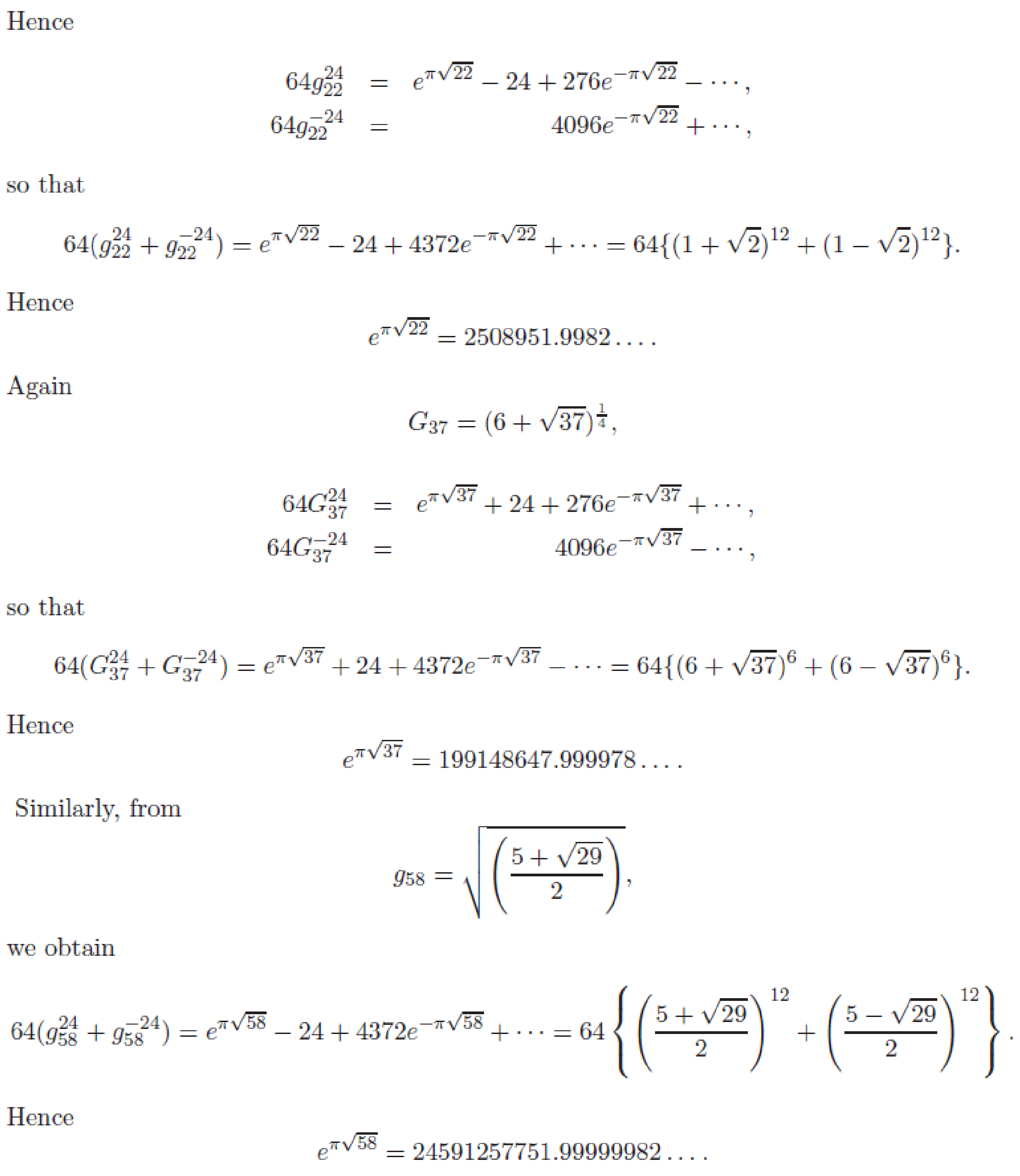
$\arg(z)$ is the complex argument

$\lfloor x \rfloor$ is the floor function

From:

**Modular equations and approximations to $\pi$** - *Srinivasa Ramanujan* - Quarterly Journal of Mathematics, XLV, 1914, 350 – 372

We have that:



Hence

$$\begin{aligned} 64g_{22}^{24} &= e^{\pi\sqrt{22}} - 24 + 276e^{-\pi\sqrt{22}} - \cdots, \\ 64g_{22}^{-24} &= 4096e^{-\pi\sqrt{22}} + \cdots, \end{aligned}$$

so that

$$64(g_{22}^{24} + g_{22}^{-24}) = e^{\pi\sqrt{22}} - 24 + 4372e^{-\pi\sqrt{22}} + \cdots = 64\{(1+\sqrt{2})^{12} + (1-\sqrt{2})^{12}\}.$$

Hence

$$e^{\pi\sqrt{22}} = 2508951.9982\ldots.$$

Again

$$G_{37} = (6+\sqrt{37})^{\frac{1}{4}},$$

$$\begin{aligned} 64G_{37}^{24} &= e^{\pi\sqrt{37}} + 24 + 276e^{-\pi\sqrt{37}} + \cdots, \\ 64G_{37}^{-24} &= 4096e^{-\pi\sqrt{37}} - \cdots, \end{aligned}$$

so that

$$64(G_{37}^{24} + G_{37}^{-24}) = e^{\pi\sqrt{37}} + 24 + 4372e^{-\pi\sqrt{37}} - \cdots = 64\{(6+\sqrt{37})^{6} + (6-\sqrt{37})^{6}\}.$$

Hence

$$e^{\pi\sqrt{37}} = 199148647.999978\ldots.$$

Similarly, from

$$g_{58} = \sqrt{\left(\frac{5+\sqrt{29}}{2}\right)},$$

we obtain

$$64(g_{58}^{24} + g_{58}^{-24}) = e^{\pi\sqrt{58}} - 24 + 4372e^{-\pi\sqrt{58}} + \cdots = 64\left\{\left(\frac{5+\sqrt{29}}{2}\right)^{12} + \left(\frac{5-\sqrt{29}}{2}\right)^{12}\right\}.$$

Hence

$$e^{\pi\sqrt{58}} = 24591257751.99999982\ldots.$$

We note that, with regard 4372, we can to obtain the following results:

27((4372)^1/2-2-1/2(((√(10-2√5) -2))⁄((√5-1))))+φ

### Input

$$27\left(\sqrt{4372}-2-\frac{1}{2}\times\frac{\sqrt{10-2\sqrt{5}}-2}{\sqrt{5}-1}\right)+\phi$$

$\phi$ is the golden ratio

### Result

$$\phi+27\left(-2+2\sqrt{1093}-\frac{\sqrt{10-2\sqrt{5}}-2}{2\left(\sqrt{5}-1\right)}\right)$$

### Decimal approximation

1729.0526944170905625170637208637148763684189306538457854815447023

…

1729.0526944….

This result is very near to the mass of candidate glueball **$f_0$(1710) scalar meson.** Furthermore, 1728 occurs in the algebraic formula for the j-invariant of an elliptic curve. ($1728 = 8^2 * 3^3$) The number 1728 is one less than the Hardy–Ramanujan number 1729 (taxicab number)

### Alternate forms

$$\frac{1}{8}\left(-27\sqrt{5\left(10-2\sqrt{5}\right)}+58\sqrt{5}+432\sqrt{1093}-27\sqrt{2\left(5-\sqrt{5}\right)}-374\right)$$

$$\phi-54+54\sqrt{1093}+\frac{27}{4}\left(1+\sqrt{5}-\sqrt{2\left(5+\sqrt{5}\right)}\right)$$

$$\phi - 54 + 54\sqrt{1093} - \frac{27\left(\sqrt{10 - 2\sqrt{5}} - 2\right)}{2\left(\sqrt{5} - 1\right)}$$

## Minimal polynomial

$$256\,x^8 + 95\,744\,x^7 - 3\,248\,750\,080\,x^6 - 914\,210\,725\,504\,x^5 + 15\,498\,355\,554\,921\,184\,x^4 + 2\,911\,478\,392\,539\,914\,656\,x^3 - 32\,941\,144\,911\,224\,677\,091\,680\,x^2 - 3\,092\,528\,914\,069\,760\,354\,714\,456\,x + 26\,320\,050\,609\,744\,039\,027\,169\,013\,041$$

## Expanded forms

$$-\frac{187}{4} + \frac{29\sqrt{5}}{4} + 54\sqrt{1093} - \frac{27}{8}\sqrt{10 - 2\sqrt{5}} - \frac{27}{8}\sqrt{5\left(10 - 2\sqrt{5}\right)}$$

$$-\frac{107}{2} + \frac{\sqrt{5}}{2} + 54\sqrt{1093} + \frac{27}{\sqrt{5} - 1} - \frac{27\sqrt{10 - 2\sqrt{5}}}{2\left(\sqrt{5} - 1\right)}$$

## Series representations

$$27\left(\sqrt{4372} - 2 - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{\left(\sqrt{5} - 1\right)2}\right) + \phi = \left(162 - 108\sqrt{1093} - 2\phi - 108\sqrt{4}\sum_{k=0}^{\infty} 4^{-k}\binom{\frac{1}{2}}{k} + 108\sqrt{1093}\sqrt{4}\sum_{k=0}^{\infty} 4^{-k}\binom{\frac{1}{2}}{k} + 2\phi\sqrt{4}\sum_{k=0}^{\infty} 4^{-k}\binom{\frac{1}{2}}{k} - 27\sqrt{9 - 2\sqrt{5}}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(9 - 2\sqrt{5}\right)^{-k}\right) \Bigg/ \left(2\left(-1 + \sqrt{4}\sum_{k=0}^{\infty} 4^{-k}\binom{\frac{1}{2}}{k}\right)\right)$$

$$
\begin{aligned}
&27\left(\sqrt{4372}-2-\frac{\sqrt{10-2\sqrt{5}}-2}{\left(\sqrt{5}-1\right)2}\right)+\phi= \\
&\left(162-108\sqrt{1093}-2\phi-108\sqrt{4}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}+\right. \\
&\quad 108\sqrt{1093}\sqrt{4}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}+2\phi\sqrt{4}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}- \\
&\quad \left.27\sqrt{9-2\sqrt{5}}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(9-2\sqrt{5}\right)^{-k}}{k!}\right)\Bigg/ \\
&\left(2\left(-1+\sqrt{4}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
&27\left(\sqrt{4372}-2-\frac{\sqrt{10-2\sqrt{5}}-2}{\left(\sqrt{5}-1\right)2}\right)+\phi= \\
&\left(162-108\sqrt{1093}-2\phi-108\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}+\right. \\
&\quad 108\sqrt{1093}\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}+ \\
&\quad 2\phi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}- \\
&\quad \left.27\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(10-2\sqrt{5}-z_0\right)^k z_0^{-k}}{k!}\right)\Bigg/ \\
&\left(2\left(-1+\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}\right)\right)
\end{aligned}
$$

for (not ($z_0 \in \mathbb{R}$ and $-\infty < z_0 \leq 0$))

Or:

27((4096+276)^1/2-2-1/2(((√(10-2√5) -2))/((√5-1))))+φ

**Input**

$$27\left(\sqrt{4096+276}-2-\frac{1}{2}\times\frac{\sqrt{10-2\sqrt{5}}-2}{\sqrt{5}-1}\right)+\phi$$

$\phi$ is the golden ratio

**Result**

$$\phi+27\left(-2+2\sqrt{1093}-\frac{\sqrt{10-2\sqrt{5}}-2}{2\left(\sqrt{5}-1\right)}\right)$$

**Decimal approximation**

1729.0526944170905625170637208637148763684189306538457854815447023…

1729.0526944…. as above

**Alternate forms**

$$\frac{1}{8}\left(-27\sqrt{5\left(10-2\sqrt{5}\right)}+58\sqrt{5}+432\sqrt{1093}-27\sqrt{2\left(5-\sqrt{5}\right)}-374\right)$$

$$\phi-54+54\sqrt{1093}+\frac{27}{4}\left(1+\sqrt{5}-\sqrt{2\left(5+\sqrt{5}\right)}\right)$$

$$\phi-54+54\sqrt{1093}-\frac{27\left(\sqrt{10-2\sqrt{5}}-2\right)}{2\left(\sqrt{5}-1\right)}$$

## Minimal polynomial

$$256 x^8 + 95744 x^7 - 3248750080 x^6 - 914210725504 x^5 + 15498355554921184 x^4 + 2911478392539914656 x^3 - 32941144911224677091680 x^2 - 3092528914069760354714456 x + 26320050609744039027169013041$$

## Expanded forms

$$-\frac{187}{4} + \frac{29\sqrt{5}}{4} + 54\sqrt{1093} - \frac{27}{8}\sqrt{10 - 2\sqrt{5}} - \frac{27}{8}\sqrt{5\left(10 - 2\sqrt{5}\right)}$$

$$-\frac{107}{2} + \frac{\sqrt{5}}{2} + 54\sqrt{1093} + \frac{27}{\sqrt{5} - 1} - \frac{27\sqrt{10 - 2\sqrt{5}}}{2\left(\sqrt{5} - 1\right)}$$

## Series representations

$$27\left(\sqrt{4096 + 276} - 2 - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{\left(\sqrt{5} - 1\right)2}\right) + \phi = \left(162 - 108\sqrt{1093} - 2\phi - 108\sqrt{4}\sum_{k=0}^{\infty} 4^{-k}\binom{\frac{1}{2}}{k} + 108\sqrt{1093}\sqrt{4}\sum_{k=0}^{\infty} 4^{-k}\binom{\frac{1}{2}}{k} + 2\phi\sqrt{4}\sum_{k=0}^{\infty} 4^{-k}\binom{\frac{1}{2}}{k} - 27\sqrt{9 - 2\sqrt{5}}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(9 - 2\sqrt{5}\right)^{-k}\right) \Big/ \left(2\left(-1 + \sqrt{4}\sum_{k=0}^{\infty} 4^{-k}\binom{\frac{1}{2}}{k}\right)\right)$$

$$
\begin{aligned}
&27\left(\sqrt{4096+276}-2-\frac{\sqrt{10-2\sqrt{5}}-2}{\left(\sqrt{5}-1\right)2}\right)+\phi= \\
&\left(162-108\sqrt{1093}-2\phi-108\sqrt{4}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^{k}\left(-\frac{1}{2}\right)_{k}}{k!}+\right. \\
&\qquad 108\sqrt{1093}\sqrt{4}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^{k}\left(-\frac{1}{2}\right)_{k}}{k!}+2\phi\sqrt{4}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^{k}\left(-\frac{1}{2}\right)_{k}}{k!}- \\
&\qquad \left.27\sqrt{9-2\sqrt{5}}\sum_{k=0}^{\infty}\frac{(-1)^{k}\left(-\frac{1}{2}\right)_{k}\left(9-2\sqrt{5}\right)^{-k}}{k!}\right)\Bigg/ \\
&\left(2\left(-1+\sqrt{4}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^{k}\left(-\frac{1}{2}\right)_{k}}{k!}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
&27\left(\sqrt{4096+276}-2-\frac{\sqrt{10-2\sqrt{5}}-2}{\left(\sqrt{5}-1\right)2}\right)+\phi= \\
&\left(162-108\sqrt{1093}-2\phi-108\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^{k}\left(-\frac{1}{2}\right)_{k}(5-z_0)^{k}z_0^{-k}}{k!}+\right. \\
&\qquad 108\sqrt{1093}\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^{k}\left(-\frac{1}{2}\right)_{k}(5-z_0)^{k}z_0^{-k}}{k!}+ \\
&\qquad 2\phi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^{k}\left(-\frac{1}{2}\right)_{k}(5-z_0)^{k}z_0^{-k}}{k!}- \\
&\qquad \left.27\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^{k}\left(-\frac{1}{2}\right)_{k}\left(10-2\sqrt{5}-z_0\right)^{k}z_0^{-k}}{k!}\right)\Bigg/ \\
&\left(2\left(-1+\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^{k}\left(-\frac{1}{2}\right)_{k}(5-z_0)^{k}z_0^{-k}}{k!}\right)\right)
\end{aligned}
$$

for (not ($z_0 \in \mathbb{R}$ and $-\infty < z_0 \leq 0$))

From which:

(27((4372)^1/2-2-1/2(((√(10-2√5) -2))/((√5-1))))+φ)^1/15

**Input**

$$\sqrt[15]{27\left(\sqrt{4372}-2-\frac{1}{2}\times\frac{\sqrt{10-2\sqrt{5}}-2}{\sqrt{5}-1}\right)+\phi}$$

$\phi$ is the golden ratio

**Exact result**

$$\sqrt[15]{\phi+27\left(-2+2\sqrt{1093}-\frac{\sqrt{10-2\sqrt{5}}-2}{2\left(\sqrt{5}-1\right)}\right)}$$

**Decimal approximation**

1.6438185685849862799902301317036810054185756873505184804834183124

...

$1.64381856858\ldots. \approx \zeta(2) = \frac{\pi^2}{6} = 1.644934\ldots$

**Alternate forms**

$$\sqrt[15]{\phi-54+54\sqrt{1093}-\frac{27\left(\sqrt{10-2\sqrt{5}}-2\right)}{2\left(\sqrt{5}-1\right)}}$$

$$\frac{1}{\sqrt[15]{\frac{2\left(\sqrt{5}-1\right)}{166-108\sqrt{5}-108\sqrt{1093}+108\sqrt{5465}-27\sqrt{2\left(5-\sqrt{5}\right)}}}}$$

$$\sqrt[15]{\boxed{\begin{array}{l}\text{root of }\ 256\,x^8 + 95\,744\,x^7 - 3\,248\,750\,080\,x^6 - 914\,210\,725\,504\,x^5 + \\ \quad 15\,498\,355\,554\,921\,184\,x^4 + 2\,911\,478\,392\,539\,914\,656\,x^3 - \\ \quad 32\,941\,144\,911\,224\,677\,091\,680\,x^2 - 3\,092\,528\,914\,069\,760\,354\,714\,456\,x + \\ \quad 26\,320\,050\,609\,744\,039\,027\,169\,013\,041\ \ \text{near}\ \ x = 1729.05\end{array}}}$$

## Minimal polynomial

$$\begin{array}{l}256\,x^{120} + 95\,744\,x^{105} - 3\,248\,750\,080\,x^{90} - \\ \quad 914\,210\,725\,504\,x^{75} + 15\,498\,355\,554\,921\,184\,x^{60} + \\ \quad 2\,911\,478\,392\,539\,914\,656\,x^{45} - 32\,941\,144\,911\,224\,677\,091\,680\,x^{30} - \\ \quad 3\,092\,528\,914\,069\,760\,354\,714\,456\,x^{15} + 26\,320\,050\,609\,744\,039\,027\,169\,013\,041\end{array}$$

## Expanded forms

$$\sqrt[15]{\frac{1}{2}\left(1+\sqrt{5}\right) + 27\left(-2 + 2\sqrt{1093} - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{2\left(\sqrt{5} - 1\right)}\right)}$$

$$\sqrt[15]{-\frac{187}{4} + \frac{29\sqrt{5}}{4} + 54\sqrt{1093} - \frac{27}{8}\sqrt{10 - 2\sqrt{5}} - \frac{27}{8}\sqrt{5\left(10 - 2\sqrt{5}\right)}}$$

## All 15th roots of ϕ + 27 (-2 + 2 sqrt(1093) - (sqrt(10 - 2 sqrt(5)) - 2)/(2 (sqrt(5) - 1)))

$$e^0\sqrt[15]{\phi + 27\left(-2 + 2\sqrt{1093} - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{2\left(\sqrt{5} - 1\right)}\right)} \approx 1.64382 \ \text{(real, principal root)}$$

$$e^{(2 i \pi)/15}\sqrt[15]{\phi + 27\left(-2 + 2\sqrt{1093} - \frac{\sqrt{10 - 2\sqrt{5}} - 2}{2\left(\sqrt{5} - 1\right)}\right)} \approx 1.50170 + 0.6686\,i$$

$$e^{(4 i \pi)/15} \sqrt[15]{\phi+27\left(-2+2\sqrt{1093}-\frac{\sqrt{10-2\sqrt{5}}-2}{2\left(\sqrt{5}-1\right)}\right)} \approx 1.0999+1.2216\,i$$

.

$$e^{(2 i \pi)/5} \sqrt[15]{\phi+27\left(-2+2\sqrt{1093}-\frac{\sqrt{10-2\sqrt{5}}-2}{2\left(\sqrt{5}-1\right)}\right)} \approx 0.5080+1.5634\,i$$

.

$$e^{(8 i \pi)/15} \sqrt[15]{\phi+27\left(-2+2\sqrt{1093}-\frac{\sqrt{10-2\sqrt{5}}-2}{2\left(\sqrt{5}-1\right)}\right)} \approx -0.17183+1.63481\,i$$

.

## Series representations

$$\sqrt[15]{27\left(\sqrt{4372}-2-\frac{\sqrt{10-2\sqrt{5}}-2}{\left(\sqrt{5}-1\right)2}\right)+\phi} =$$

$$\frac{1}{\sqrt[15]{2}}\left(\left(\left(\left(162-108\sqrt{1093}-2\phi-108\sqrt{4}\sum_{k=0}^{\infty}4^{-k}\binom{\frac{1}{2}}{k}+108\sqrt{1093}\sqrt{4}\sum_{k=0}^{\infty}4^{-k}\binom{\frac{1}{2}}{k}+2\phi\sqrt{4}\sum_{k=0}^{\infty}4^{-k}\binom{\frac{1}{2}}{k}-27\sqrt{9-2\sqrt{5}}\sum_{k=0}^{\infty}\binom{\frac{1}{2}}{k}\left(9-2\sqrt{5}\right)^{-k}\right)\middle/\left(-1+\sqrt{4}\sum_{k=0}^{\infty}4^{-k}\binom{\frac{1}{2}}{k}\right)\right)\right)^{\wedge}(1/15)\right)$$

$$\sqrt[15]{27\left(\sqrt{4372}-2-\frac{\sqrt{10-2\sqrt{5}}-2}{\left(\sqrt{5}-1\right)2}\right)+\phi}=$$

$$\frac{1}{\sqrt[15]{2}}\left(\left(\left(162-108\sqrt{1093}-2\phi-108\sqrt{4}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}+108\sqrt{1093}\sqrt{4}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}+2\phi\sqrt{4}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}-27\sqrt{9-2\sqrt{5}}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(9-2\sqrt{5}\right)^{-k}}{k!}\right)\Bigg/\left(-1+\sqrt{4}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{4}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)\right){}^\wedge(1/15)\right)$$

$$\sqrt[15]{27\left(\sqrt{4372}-2-\frac{\sqrt{10-2\sqrt{5}}-2}{\left(\sqrt{5}-1\right)2}\right)+\phi}=$$

$$\frac{1}{\sqrt[15]{2}}\left(\left(\left(162-108\sqrt{1093}-2\phi-108\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}+108\sqrt{1093}\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}+2\phi\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}-27\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k\left(10-2\sqrt{5}-z_0\right)^k z_0^{-k}}{k!}\right)\Bigg/\left(-1+\sqrt{z_0}\sum_{k=0}^{\infty}\frac{(-1)^k\left(-\frac{1}{2}\right)_k(5-z_0)^k z_0^{-k}}{k!}\right)\right){}^\wedge(1/15)\right)$$

for (not ($z_0 \in \mathbb{R}$ and $-\infty < z_0 \leq 0$))

## Integral representation

$$(1+z)^a=\frac{\int_{-i\infty+\gamma}^{i\infty+\gamma}\frac{\Gamma(s)\Gamma(-a-s)}{z^s}\,ds}{(2\pi i)\Gamma(-a)}\quad \text{for } (0<\gamma<-\operatorname{Re}(a) \text{ and } |\arg(z)|<\pi)$$

From:

**An Update on Brane Supersymmetry Breaking -** *J. Mourad and A. Sagnotti* - arXiv:1711.11494v1 [hep-th] 30 Nov 2017

From the following vacuum equations:

$$T\, e^{\gamma_E\, \phi} \;=\; -\, \frac{\beta_E^{(p)}\, h^2}{\gamma_E}\; e^{-\,2\,(8\,-\,p)\,C\,+\,2\,\beta_E^{(p)}\,\phi}$$

$$16\, k'\, e^{-\,2\,C} \;=\; \frac{h^2\left(p\;+\;1\;-\;\frac{2\,\beta_E^{(p)}}{\gamma_E}\right)\, e^{-\,2\,(8\,-\,p)\,C\,+\,2\,\beta_E^{(p)}\,\phi}}{(7\;-\;p)}$$

$$(A')^2 \;=\; k\, e^{-\,2\,A} \;+\; \frac{h^2}{16(p\;+\;1)}\left(7\;-\;p\;+\;\frac{2\,\beta_E^{(p)}}{\gamma_E}\right)\, e^{-\,2\,(8\,-\,p)\,C\,+\,2\,\beta_E^{(p)}\,\phi}$$

we have obtained, from the results almost equals of the equations, putting

$4096\, e^{-\pi\sqrt{18}}$ instead of

$$e^{-\,2\,(8\,-\,p)\,C\,+\,2\,\beta_E^{(p)}\,\phi}$$

a new possible mathematical connection between the two exponentials. Thence, also the values concerning $p$, $C$, $\beta_E$ and $\phi$ correspond to the exponents of $e$ (i.e. of exp). Thence we obtain for p = 5 and $\beta_E$ = 1/2:

$$e^{-6C+\phi} = 4096e^{-\pi\sqrt{18}}$$

Therefore, with respect to the exponentials of the vacuum equations, the Ramanujan’s exponential has a coefficient of 4096 which is equal to $64^2$, while $-6C+\phi$ is equal to $-\pi\sqrt{18}$. From this it follows that it is possible to establish mathematically, the dilaton value.

For

exp((-Pi*sqrt(18)) we obtain:

**Input:**

$$\exp\left(-\pi\sqrt{18}\right)$$

**Exact result:**

$$e^{-3\sqrt{2}\,\pi}$$

**Decimal approximation:**

$$1.6272016226072509292942156739117979541838581136954016\ldots \times 10^{-6}$$

$1.6272016\ldots * 10^{-6}$

**Property:**

$e^{-3\sqrt{2}\,\pi}$ is a transcendental number

**Series representations:**

$$e^{-\pi\sqrt{18}} = e^{-\pi\sqrt{17}\sum_{k=0}^{\infty} 17^{-k}\binom{1/2}{k}}$$

$$e^{-\pi\sqrt{18}} = \exp\left(-\pi\sqrt{17}\sum_{k=0}^{\infty}\frac{\left(-\frac{1}{17}\right)^k\left(-\frac{1}{2}\right)_k}{k!}\right)$$

$$e^{-\pi \sqrt{18}} = \exp\left(-\frac{\pi \sum_{j=0}^{\infty} \operatorname{Res}_{s=-\frac{1}{2}+j} 17^{-s}\, \Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{2\sqrt{\pi}}\right)$$

Now, we have the following calculations:

$$e^{-6C+\phi} = 4096 e^{-\pi\sqrt{18}}$$

$$e^{-\pi\sqrt{18}} = 1.6272016\ldots * 10^{-6}$$

from which:

$$\frac{1}{4096} e^{-6C+\phi} = 1.6272016\ldots * 10^{-6}$$

$$0.000244140625\, e^{-6C+\phi} = e^{-\pi\sqrt{18}} = 1.6272016\ldots * 10^{-6}$$

Now:

$$\ln\left(e^{-\pi\sqrt{18}}\right) = -13.328648814475 = -\pi\sqrt{18}$$

And:

(1.6272016* 10^-6) *1/ (0.000244140625)

**Input interpretation:**

$$\frac{1.6272016}{10^6} \times \frac{1}{0.000244140625}$$

**Result:**

0.0066650177536

0.006665017...

Thence:

$$0.000244140625\, e^{-6C+\phi} = e^{-\pi\sqrt{18}}$$

Dividing both sides by 0.000244140625, we obtain:

$$\frac{0.000244140625}{0.000244140625} e^{-6C+\phi} = \frac{1}{0.000244140625} e^{-\pi\sqrt{18}}$$

$$e^{-6C+\phi} = 0.0066650177536$$

((((exp((-Pi*sqrt(18)))))))*1/0.000244140625

**Input interpretation:**

$$\exp\left(-\pi\sqrt{18}\right) \times \frac{1}{0.000244140625}$$

**Result:**

0.00666501785…

0.00666501785…

**Series representations:**

$$\frac{\exp(-\pi\sqrt{18})}{0.000244141} = 4096 \exp\left(-\pi\sqrt{17}\sum_{k=0}^{\infty} 17^{-k}\binom{\frac{1}{2}}{k}\right)$$

$$\frac{\exp(-\pi\sqrt{18})}{0.000244141} = 4096 \exp\left(-\pi\sqrt{17}\sum_{k=0}^{\infty} \frac{\left(-\frac{1}{17}\right)^k \left(-\frac{1}{2}\right)_k}{k!}\right)$$

$$\frac{\exp(-\pi\sqrt{18})}{0.000244141} = 4096 \exp\left(-\frac{\pi \sum_{j=0}^{\infty} \operatorname{Res}_{s=-\frac{1}{2}+j} 17^{-s}\,\Gamma\left(-\frac{1}{2}-s\right)\Gamma(s)}{2\sqrt{\pi}}\right)$$

Now:

$$e^{-6C+\phi} = 0.0066650177536$$

$$\exp\left(-\pi\sqrt{18}\right)\times\frac{1}{0.000244140625} =$$

$$e^{-\pi\sqrt{18}}\times\frac{1}{0.000244140625}$$

$$= 0.00666501785\ldots$$

From:

ln(0.00666501784619)

**Input interpretation:**

$\log(0.00666501784619)$

**Result:**

$-5.010882647757\ldots$

-5.010882647757…

**Alternative representations:**

$$\log(0.006665017846190000) = \log_e(0.006665017846190000)$$

$$\log(0.006665017846190000) = \log(a)\log_a(0.006665017846190000)$$

$$\log(0.006665017846190000) = -\text{Li}_1(0.993334982153810000)$$

**Series representations:**

$$\log(0.006665017846190000) = -\sum_{k=1}^{\infty} \frac{(-1)^k (-0.993334982153810000)^k}{k}$$

$$\log(0.006665017846190000) = 2 i \pi \left\lfloor \frac{\arg(0.006665017846190000 - x)}{2\pi} \right\rfloor + \log(x) - \sum_{k=1}^{\infty} \frac{(-1)^k (0.006665017846190000 - x)^k x^{-k}}{k} \quad \text{for } x < 0$$

$$\log(0.006665017846190000) = \left\lfloor \frac{\arg(0.006665017846190000 - z_0)}{2\pi} \right\rfloor \log\left(\frac{1}{z_0}\right) + \log(z_0) + \left\lfloor \frac{\arg(0.006665017846190000 - z_0)}{2\pi} \right\rfloor \log(z_0) - \sum_{k=1}^{\infty} \frac{(-1)^k (0.006665017846190000 - z_0)^k z_0^{-k}}{k}$$

**Integral representation:**

$$\log(0.006665017846190000) = \int_1^{0.006665017846190000} \frac{1}{t}\, dt$$

In conclusion:

$$-6C + \phi = -5.010882647757\ldots$$

and for C = 1, we obtain:

$$\phi = -5.010882647757 + 6 = 0.989117352243 = \boldsymbol{\phi}$$

Note that the values of $n_s$ (spectral index) 0.965, of the average of the Omega mesons Regge slope 0.987428571 and of the dilaton 0.989117352243, are also connected to the following two Rogers-Ramanujan continued fractions:

$$\frac{e^{-\frac{\pi}{5}}}{\sqrt{(\varphi-1)\sqrt{5}} - \varphi + 1} = 1 - \cfrac{e^{-\pi}}{1 + \cfrac{e^{-2\pi}}{1 + \cfrac{e^{-3\pi}}{1 + \cfrac{e^{-4\pi}}{1 + \ldots}}}} \approx 0.9568666373$$

$$\frac{e^{-\frac{\pi}{\sqrt{5}}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\varphi^5\sqrt[4]{5^3}}-1}}-\varphi+1}=1-\frac{e^{-\pi\sqrt{5}}}{1+\frac{e^{-2\pi\sqrt{5}}}{1+\frac{e^{-3\pi\sqrt{5}}}{1+\frac{e^{-4\pi\sqrt{5}}}{1+\dots}}}}\approx 0.9991104684$$

(http://www.bitman.name/math/article/102/109/)

Also performing the 512th root of the inverse value of the Pion meson rest mass 139.57, we obtain:

((1/(139.57)))^1/512

**Input interpretation:**

$$\sqrt[512]{\frac{1}{139.57}}$$

**Result:**

0.99040073270864402755097375571330141546073279617855551684...

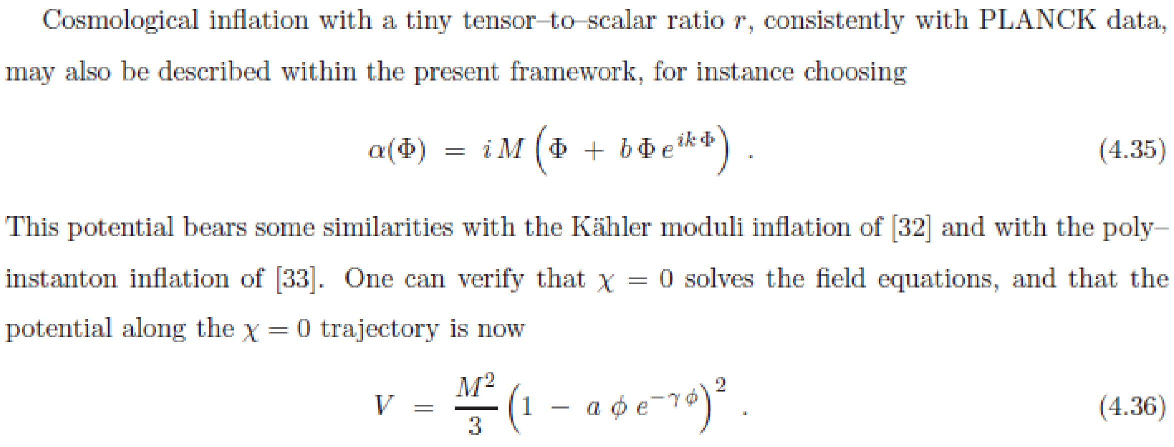
0.99040073.... result very near to the dilaton value 0.989117352243 = $\boldsymbol{\phi}$ and to the value of the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{\pi}{\sqrt{5}}}}{\frac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\varphi^5\sqrt[4]{5^3}}-1}}-\varphi+1}=1-\frac{e^{-\pi\sqrt{5}}}{1+\frac{e^{-2\pi\sqrt{5}}}{1+\frac{e^{-3\pi\sqrt{5}}}{1+\frac{e^{-4\pi\sqrt{5}}}{1+\dots}}}}\approx 0.9991104684$$

From

**Properties of Nilpotent Supergravity -** *E. Dudas, S. Ferrara, A. Kehagias and A. Sagnotti* - arXiv:1507.07842v2 [hep-th] 14 Sep 2015

We have that:



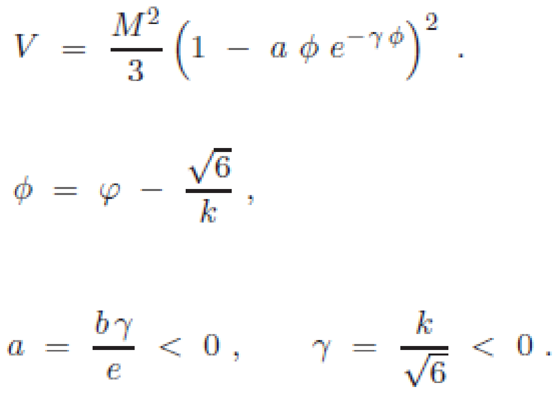
Cosmological inflation with a tiny tensor–to–scalar ratio $r$, consistently with PLANCK data, may also be described within the present framework, for instance choosing

$$\alpha(\Phi) \;=\; i\,M\left(\Phi \;+\; b\,\Phi\,e^{ik\,\Phi}\right) \;. \tag{4.35}$$

This potential bears some similarities with the Kähler moduli inflation of [32] and with the poly–instanton inflation of [33]. One can verify that $\chi\,=\,0$ solves the field equations, and that the potential along the $\chi = 0$ trajectory is now

$$V \;=\; \frac{M^2}{3}\left(1 \;-\; a\,\phi\,e^{-\gamma\,\phi}\right)^2 \;. \tag{4.36}$$

We analyzing the following equation:



$$V \;=\; \frac{M^2}{3}\left(1 \;-\; a\,\phi\,e^{-\gamma\,\phi}\right)^2 \;.$$

$$\phi \;=\; \varphi \;-\; \frac{\sqrt{6}}{k}\;,$$

$$a \;=\; \frac{b\,\gamma}{e} \;<\; 0\;, \qquad \gamma \;=\; \frac{k}{\sqrt{6}} \;<\; 0\;.$$

We have:

(M^2)/3*[1-(b/euler number * k/sqrt6) * (φ- sqrt6/k) * exp(-(k/sqrt6)(φ- sqrt6/k))]^2

i.e.

V = (M^2)/3*[1-(b/euler number * k/sqrt6) * (φ- sqrt6/k) * exp(-(k/sqrt6)(φ- sqrt6/k))]^2

For k = 2 and φ = 0.9991104684, that is the value of the scalar field that is equal to the value of the following Rogers-Ramanujan continued fraction:

$$\frac{e^{-\frac{\pi}{\sqrt{5}}}}{\dfrac{\sqrt{5}}{1+\sqrt[5]{\sqrt{\varphi^5\sqrt[4]{5^3}}-1}}-\varphi+1}=1-\cfrac{e^{-\pi\sqrt{5}}}{1+\cfrac{e^{-2\pi\sqrt{5}}}{1+\cfrac{e^{-3\pi\sqrt{5}}}{1+\cfrac{e^{-4\pi\sqrt{5}}}{1+\dots}}}}\approx 0.9991104684$$

we obtain:

V = (M^2)/3*[1-(b/euler number * 2/sqrt6) * (0.9991104684- sqrt6/2) * exp(-(2/sqrt6)(0.9991104684- sqrt6/2))]^2

**Input interpretation:**

$$V = \frac{M^2}{3}\left(1-\left(\frac{b}{e}\times\frac{2}{\sqrt{6}}\right)\left(0.9991104684-\frac{\sqrt{6}}{2}\right)\exp\left(-\frac{2}{\sqrt{6}}\left(0.9991104684-\frac{\sqrt{6}}{2}\right)\right)\right)^2$$

**Result:**

$$V = \frac{1}{3}\left(0.0814845\,b+1\right)^2 M^2$$

**Solutions:**

$$b = \frac{225.913\left(-0.054323\, M^2 \pm 6.58545\times 10^{-10}\sqrt{M^4}\right)}{M^2} \quad (M \neq 0)$$

**Alternate forms:**

$$V = 0.00221324\,(b + 12.2723)^2\, M^2$$

$$V = 0.00221324\left(b^2\, M^2 + 24.5445\, b\, M^2 + 150.609\, M^2\right)$$

$$-0.00221324\, b^2\, M^2 - 0.054323\, b\, M^2 - \frac{M^2}{3} + V = 0$$

**Expanded form:**

$$V = 0.00221324\, b^2\, M^2 + 0.054323\, b\, M^2 + \frac{M^2}{3}$$

**Alternate form assuming b, M, and V are positive:**

$$V = 0.00221324\,(b + 12.2723)^2\, M^2$$

**Alternate form assuming b, M, and V are real:**

$$V = 0.00221324\, b^2\, M^2 + 0.054323\, b\, M^2 + 0.333333\, M^2 + 0$$

**Derivative:**

$$\frac{\partial}{\partial b}\left(\frac{1}{3}\,(0.0814845\, b + 1)^2\, M^2\right) = 0.054323\,(0.0814845\, b + 1)\, M^2$$

## Implicit derivatives

$$\frac{\partial b(M,V)}{\partial V} = \frac{154\,317\,775\,011\,120\,075}{36\,961\,748\,(226\,802\,245 + 18\,480\,874\,b)\,M^2}$$

$$\frac{\partial b(M,V)}{\partial M} = -\frac{\frac{226\,802\,245}{18\,480\,874} + b}{M}$$

$$\frac{\partial M(b,V)}{\partial V} = \frac{154\,317\,775\,011\,120\,075}{2\,(226\,802\,245 + 18\,480\,874\,b)^2\,M}$$

$$\frac{\partial M(b,V)}{\partial b} = -\frac{18\,480\,874\,M}{226\,802\,245 + 18\,480\,874\,b}$$

$$\frac{\partial V(b,M)}{\partial M} = \frac{2\,(226\,802\,245 + 18\,480\,874\,b)^2\,M}{154\,317\,775\,011\,120\,075}$$

$$\frac{\partial V(b,M)}{\partial b} = \frac{36\,961\,748\,(226\,802\,245 + 18\,480\,874\,b)\,M^2}{154\,317\,775\,011\,120\,075}$$

## Global minimum:

$$\min\left\{\frac{1}{3}\,(0.0814845\,b + 1)^2\,M^2\right\} = 0 \text{ at } (b, M) = (-16, 0)$$

**Global minima:**

$$\min\left\{\frac{1}{3} M^2 \left(1 - \frac{(b\,2)\left(0.9991104684 - \frac{\sqrt{6}}{2}\right)\exp\left(-\frac{2\left(0.9991104684-\frac{\sqrt{6}}{2}\right)}{\sqrt{6}}\right)}{e\sqrt{6}}\right)^2\right\} = 0$$

for $b = -\frac{226\,802\,245}{18\,480\,874}$

$$\min\left\{\frac{1}{3} M^2 \left(1 - \frac{(b\,2)\left(0.9991104684 - \frac{\sqrt{6}}{2}\right)\exp\left(-\frac{2\left(0.9991104684-\frac{\sqrt{6}}{2}\right)}{\sqrt{6}}\right)}{e\sqrt{6}}\right)^2\right\} = 0$$

for $M = 0$

From:

$$b = \frac{225.913\left(-0.054323\,M^2 \pm 6.58545\times 10^{-10}\sqrt{M^4}\right)}{M^2} \quad (M \neq 0)$$

we obtain:

(225.913 (-0.054323 M^2 + 6.58545×10^-10 sqrt(M^4)))/M^2

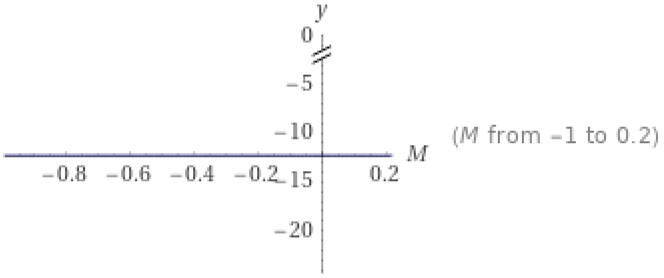
**Input interpretation:**

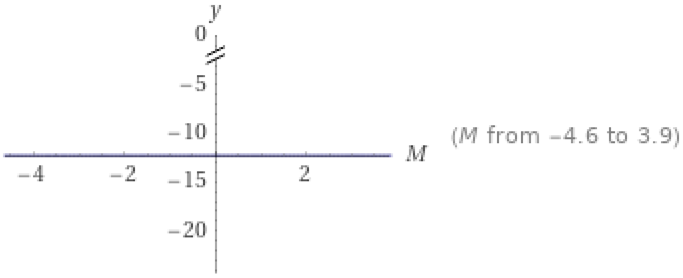
$$\frac{225.913\left(-0.054323\,M^2 + 6.58545\times 10^{-10}\sqrt{M^4}\right)}{M^2}$$

**Result:**

$$\frac{225.913\left(6.58545\times 10^{-10}\sqrt{M^4}-0.054323\,M^2\right)}{M^2}$$

**Plots:**





**Alternate form assuming M is real:**

−12.2723

-12.2723  result very near to the black hole entropy value 12.1904 = ln(196884)

## Alternate forms:

$$-\frac{12.2723\left(M^2 - 1.21228\times 10^{-8}\sqrt{M^4}\right)}{M^2}$$

$$\frac{1.48774\times 10^{-7}\sqrt{M^4} - 12.2723\,M^2}{M^2}$$

## Expanded form:

$$\frac{1.48774\times 10^{-7}\sqrt{M^4}}{M^2} - 12.2723$$

## Property as a function:

### Parity

even

## Series expansion at M = 0:

$$\left(\frac{1.48774\times 10^{-7}\sqrt{M^4}}{M^2} - 12.2723\right) + O\left(M^6\right)$$

(generalized Puiseux series)

## Series expansion at M = ∞:

$-12.2723$

## Derivative:

$$\frac{d}{dM}\left(\frac{225.913\left(6.58545\times 10^{-10}\sqrt{M^4}-0.054323\,M^2\right)}{M^2}\right)=\frac{3.55271\times 10^{-15}}{M}$$

## Indefinite integral:

$$\int \frac{225.913\left(-0.054323\,M^2+6.58545\times 10^{-10}\sqrt{M^4}\right)}{M^2}\,dM =$$
$$\frac{1.48774\times 10^{-7}\sqrt{M^4}}{M}-12.2723\,M+\text{constant}$$

## Global maximum:

$$\max\left\{\frac{225.913\left(6.58545\times 10^{-10}\sqrt{M^4}-0.054323\,M^2\right)}{M^2}\right\}=$$
$$-\frac{140\,119\,826\,723\,990\,341\,497\,649}{11\,417\,594\,849\,251\,000\,000\,000}\ \text{at}\ M=-1$$

## Global minimum:

$$\min\left\{\frac{225.913\left(6.58545\times 10^{-10}\sqrt{M^4}-0.054323\,M^2\right)}{M^2}\right\}=$$
$$-\frac{140\,119\,826\,723\,990\,341\,497\,649}{11\,417\,594\,849\,251\,000\,000\,000}\ \text{at}\ M=-1$$

**Limit:**

$$\lim_{M\to\pm\infty} \frac{225.913\left(-0.054323\, M^2 + 6.58545\times 10^{-10}\sqrt{M^4}\right)}{M^2} = -12.2723$$

**Definite integral after subtraction of diverging parts:**

$$\int_0^\infty \left(\frac{225.913\left(-0.054323\, M^2 + 6.58545\times 10^{-10}\sqrt{M^4}\right)}{M^2} - -12.2723\right) dM = 0$$

From b that is equal to

$$\frac{225.913\left(-0.054323\, M^2 + 6.58545\times 10^{-10}\sqrt{M^4}\right)}{M^2}$$

From:

$$V = \frac{1}{3}\,(0.0814845\, b + 1)^2\, M^2$$

we obtain:

1/3 (0.0814845 ((225.913 (-0.054323 M^2 + 6.58545×10^-10 sqrt(M^4)))/M^2 ) + 1)^2 M^2

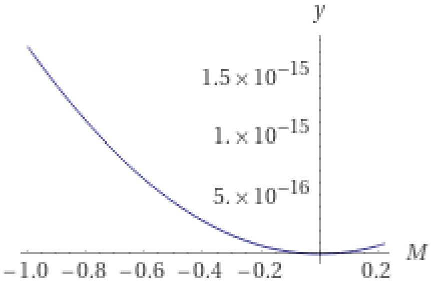
**Input interpretation:**

$$\frac{1}{3}\left(0.0814845\times\frac{225.913\left(-0.054323\, M^2 + 6.58545\times 10^{-10}\sqrt{M^4}\right)}{M^2} + 1\right)^2 M^2$$

**Result:**

0

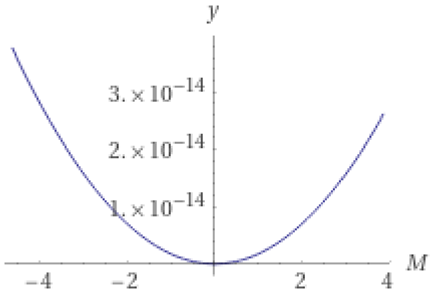
**Plots:** **(possible mathematical connection with an open string)**



(M from −1 to 0.2)

M = -0.5; M = 0.2

**(possible mathematical connection with an open string)**



(M from −4.6 to 3.9)

M = 2 ; M = 3

**Root:**

$M = 0$

## Property as a function:

### Parity

even

## Series expansion at M = 0:

$O(M^{62194})$

(Taylor series)

## Series expansion at M = ∞:

$1.75541\times 10^{-15}\, M^2 + O\left(\left(\frac{1}{M}\right)^{62194}\right)$

(Taylor series)

## Definite integral after subtraction of diverging parts:

$$\int_0^\infty \left(\frac{1}{3}\, M^2 \left(1 + \frac{18.4084\left(-0.054323\, M^2 + 6.58545\times 10^{-10}\sqrt{M^4}\right)}{M^2}\right)^2 - 1.75541\times 10^{-15}\, M^2\right) dM = 0$$

For M = - 0.5 ,  we obtain:

$$\frac{1}{3}\left(0.0814845\times\frac{225.913\left(-0.054323\,M^2+6.58545\times10^{-10}\sqrt{M^4}\right)}{M^2}+1\right)^2 M^2$$

1/3 (0.0814845 ((225.913 (-0.054323 (-0.5)^2 + 6.58545×10^-10 sqrt((-0.5)^4)))/(-0.5)^2 ) + 1)^2 * (-0.5^2)

**Input interpretation:**

$$\frac{1}{3}\left(0.0814845\times\frac{225.913\left(-0.054323\,(-0.5)^2+6.58545\times10^{-10}\sqrt{(-0.5)^4}\right)}{(-0.5)^2}+1\right)^2 \left(-0.5^2\right)$$

**Result:**

$$-4.38851344947464545348970783378088020833333333333333333333\ldots\times 10^{-16}$$

-4.38851344947*10$^{-16}$

For M = 0.2:

$$\frac{1}{3}\left(0.0814845\times\frac{225.913\left(-0.054323\,M^2+6.58545\times10^{-10}\sqrt{M^4}\right)}{M^2}+1\right)^2 M^2$$

1/3 (0.0814845 ((225.913 (-0.054323 0.2^2 + 6.58545×10^-10 sqrt(0.2^4)))/0.2^2 ) + 1)^2 0.2^2

**Input interpretation:**

$$\frac{1}{3}\left(0.0814845\times\frac{225.913\left(-0.054323\times 0.2^2+6.58545\times 10^{-10}\sqrt{0.2^4}\right)}{0.2^2}+1\right)^2\times 0.2^2$$

**Result:**

$7.021621519159432725583532534049408333333333333333333333333\ldots\times 10^{-17}$

7.021621519159*10$^{-17}$

For M = 3:

$$\frac{1}{3}\left(0.0814845\times\frac{225.913\left(-0.054323\, M^2+6.58545\times 10^{-10}\sqrt{M^4}\right)}{M^2}+1\right)^2 M^2$$

1/3 (0.0814845 ((225.913 (-0.054323 3^2 + 6.58545×10^-10 sqrt(3^4)))/3^2 ) + 1)^2 3^2

**Input interpretation:**

$$\frac{1}{3}\left(0.0814845\times\frac{225.913\left(-0.054323\times 3^2+6.58545\times 10^{-10}\sqrt{3^4}\right)}{3^2}+1\right)^2\times 3^2$$

**Result:**

$1.57986484181087236325629482016111 6875\times 10^{-14}$

1.57986484181*10$^{-14}$

For M = 2:

$$\frac{1}{3}\left(0.0814845\times\frac{225.913\left(-0.054323\,M^2+6.58545\times10^{-10}\sqrt{M^4}\right)}{M^2}+1\right)^2 M^2$$

1/3 (0.0814845 ((225.913 (-0.054323 2^2 + 6.58545×10^-10 sqrt(2^4)))/2^2 ) + 1)^2 2^2

**Input interpretation:**

$$\frac{1}{3}\left(0.0814845\times\frac{225.913\left(-0.054323\times2^2+6.58545\times10^{-10}\sqrt{2^4}\right)}{2^2}+1\right)^2\times2^2$$

**Result:**

$7.0216215191594327255835325340494083333333333333333333333333\ldots\times10^{-15}$

$7.021621519*10^{-15}$

From the four results

7.021621519*10^-15 ; 1.57986484181*10^-14 ; 7.021621519159*10^-17 ;

-4.38851344947*10^-16

we obtain, after some calculations:

sqrt[1/(2Pi)(7.021621519*10^-15 + 1.57986484181*10^-14 +7.021621519*10^-17 - 4.38851344947*10^-16)]

**Input interpretation:**

$$\sqrt{\frac{1}{2\pi}\left(7.021621519\times 10^{-15}+1.57986484181\times 10^{-14}+7.021621519\times 10^{-17}-4.38851344947\times 10^{-16}\right)}$$

**Result:**

$5.9776991059\ldots \times 10^{-8}$

5.9776991059*10$^{-8}$ result very near to the Planck's electric flow 5.975498 × 10$^{-8}$ that is equal to the following formula:

$$\phi_{\mathrm{P}}^{E} = \mathbf{E}_{\mathrm{P}}\, l_{\mathrm{P}}^{2} = \phi_{\mathrm{P}}\, l_{\mathrm{P}} = \sqrt{\frac{\hbar c}{\varepsilon_0}}$$

We note that:

1/55*(([(((1/[(7.021621519*10^-15 + 1.57986484181*10^-14 +7.021621519*10^-17 -4.38851344947*10^-16)])))^1/7]-((log^(5/8)(2))/(2 2^(1/8) 3^(1/4) e log^(3/2)(3)))))

**Input interpretation:**

$$\frac{1}{55}\left(\left(1/\left(7.021621519\times 10^{-15}+1.57986484181\times 10^{-14}+7.021621519\times 10^{-17}-4.38851344947\times 10^{-16}\right)\right)\,\hat{}\,(1/7)-\frac{\log^{5/8}(2)}{2\sqrt[8]{2}\,\sqrt[4]{3}\,e\log^{3/2}(3)}\right)$$

$\log(x)$ is the natural logarithm

**Result:**

1.6181818182…

1.6181818182… result that is a very good approximation to the value of the golden ratio 1.618033988749...

From the Planck units:

Planck Length

$$l_{\mathrm{P}} = \sqrt{\frac{4\pi\hbar G}{c^3}}$$

5.729475 * $10^{-35}$ Lorentz-Heaviside value

Planck's Electric field strength

$$\mathbf{E}_{\mathrm{P}} = \frac{F_{\mathrm{P}}}{q_{\mathrm{P}}} = \sqrt{\frac{c^7}{16\pi^2\varepsilon_0\hbar G^2}}$$

1.820306 * $10^{61}$ V*m Lorentz-Heaviside value

Planck's Electric flux

$$\phi_{\mathrm{P}}^{E} = \mathbf{E}_{\mathrm{P}} l_{\mathrm{P}}^2 = \phi_{\mathrm{P}} l_{\mathrm{P}} = \sqrt{\frac{\hbar c}{\varepsilon_0}}$$

5.975498*$10^{-8}$ V*m Lorentz-Heaviside value

Planck's Electric potential

$$\phi_P = V_P = \frac{E_P}{q_P} = \sqrt{\frac{c^4}{4\pi\varepsilon_0 G}}$$

1.042940*$10^{27}$ V Lorentz-Heaviside value

## Relationship between Planck's Electric Flux and Planck's Electric Potential

**$E_P * l_P$** = (1.820306 * $10^{61}$) * 5.729475 * $10^{-35}$

### Input interpretation:

$$\frac{(1.820306\times10^{61})\times5.729475}{10^{35}}$$

### Result:

1 042 939 771 935 000 000 000 000 000

### Scientific notation:

$1.042939771935\times10^{27}$

1.042939771935*$10^{27}$ ≈ 1.042940*$10^{27}$

Or:

**$E_P * l_P^2 / l_P$** = (5.975498*$10^{-8}$)*1/(5.729475 * $10^{-35}$)

### Input interpretation:

$$5.975498\times10^{-8}\times\frac{1}{\frac{5.729475}{10^{35}}}$$

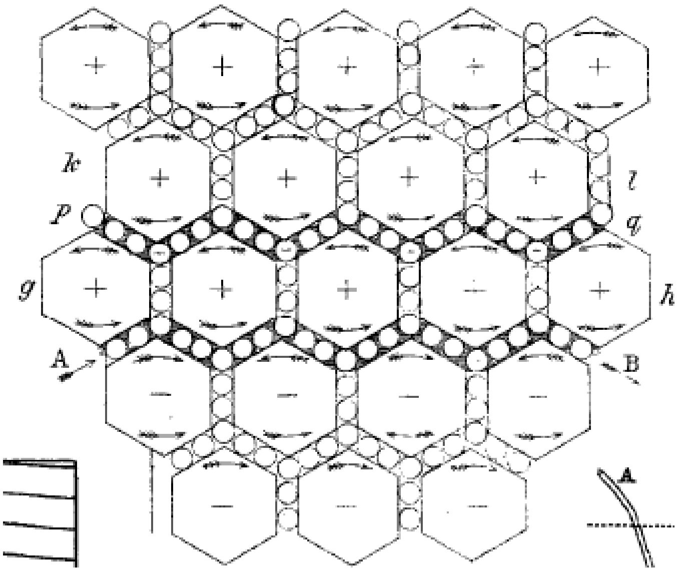
### Result:

$1.04293988541707573556041347592929544155441816222254220500133\ldots\times10^{27}$

1.042939885417*$10^{27}$ ≈ 1.042940*$10^{27}$

Fig. 1

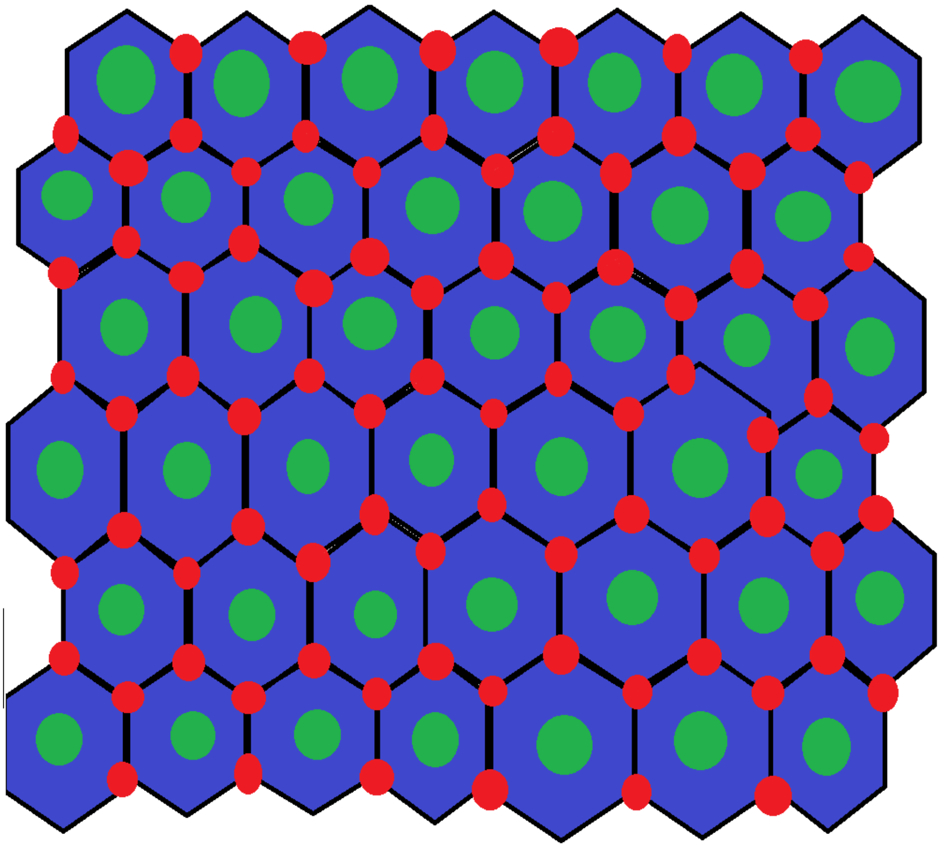
Fig: 2.



It is therefore possible to consider the vortices of the "quantum vacuum" schematized as cubes or octahedrons (the + sign inside a given vortex indicates its counterclockwise rotation, while the - sign indicates its clockwise rotation). Between vortex and vortex there is a layer of "bubbles"-universes (or universes-spheres), which flows, as in the simplified two-dimensional drawing, from A to B

Fig. 2

Immagine dello Spazio-Tempo a scala quantistica: le cironferenze in rosso rappresentano i punti corrispondenti alle dimensioni compattificate e gli esagoni in blu, rappresentano le “fluttuazioni” (universi potenziali – cerchi verdi) del vuoto quantistico (2D)



## Proposal

Image of space-time at quantum scale: the circles in red represent the points corresponding to the compactified dimensions and the hexagons in blue, represent the "fluctuations" (potential universes - green circles) of the quantum vacuum (2D). In reality, we will have n-dimensional hyperspheres in which the compactified dimensions "roll up" and octahedrons representing the "fluctuations", containing spheres (bubbles of potential universes), of the quantum vacuum

## Acknowledgments

We would like to thank Professor **Augusto Sagnotti** theoretical physicist at Scuola Normale Superiore (Pisa – Italy) for his very useful explanations and his availability.

## References

**A Number Theoretic Analysis of the Enthalpy, Enthalpy Energy Density, Thermodynamic Volume, and the Equation of State of a Modified White Hole, and the Implications to the Quantum Vacuum Spacetime, Matter Creation and the Planck Frequency.** - *Nardelli, M., Kubeka, A.S. and Amani, A.* (2024) - Journal of Modern Physics , 15, 1-50. - https://doi.org/10.4236/jmp.2024.151001

**Modular equations and approximations to** $\pi$ - *Srinivasa Ramanujan* - Quarterly Journal of Mathematics, XLV, 1914, 350 – 372

**An Update on Brane Supersymmetry Breaking -** *Jihad Mourad and Augusto Sagnotti* - arXiv:1711.11494v1 [hep-th] 30 Nov 2017

**Properties of Nilpotent Supergravity -** *E. Dudas, S. Ferrara, A. Kehagias and A. Sagnotti* - arXiv:1507.07842v2 [hep-th] 14 Sep 2015

See also:

***The Geometry of the MRB constant*** *by Marvin Ray Burns*

*https://www.academia.edu/22271085/The_Geometry_of_the_MRB_constant*

(See also Page 29 the applications of the CMRB in various sectors of Theoretical Physics (String Theory) and Cosmology )

http://xoom.virgilio.it/source_filemanager/na/ar/nardelli/michele%20and%20antonio%20papers/Try%20to%20beat%20these%20MRB%20constant%20records!%20-%20Online%20Technical%20Discussion%20Groups%E2%80%94Wolfram%20Community%20b.pdf